PTI/PTIO Application A0072006
Dovetail Energy, LLC
0829065027
June 24, 2022

TRC

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June 24, 2022

Michael Hopkins
Assistant Chief, Permitting
Ohio EPA, Division of Air Pollution Control
50 W. Town Street, Suite 700
Columbus, Ohio 43215

Eileen Moran, Administrator
Regional Air Pollution Control Agency
117 South Main Street
Dayton, Ohio 45402

Re: Dovetail Energy, LLC, Ohio EPA Facility ID 0829065027
Permit-to-Install and Operate Application for Digestate Storage Tank

Dear Mr. Hopkins and Ms. Moran:

Dovetail Energy, LLC respectfully submits this PTIO application in accordance with Paragraph 19 of the Consent Order between the State of Ohio and Renergy, Inc. entered in the Greene County Court of Common Pleas on April 25, 2022, Case No. 2022 cv 0201.

If you have any questions or need any additional information, please do not hesitate to contact me at 513-386-6288 or jslayback@trccompanies.com.

Sincerely,

TRC Environmental Corporation

Jeff Slayback, P.E.
Project Manager

cc: Alex Ringler, Renergy
Mike Oberfield, Renergy

Division of Air Pollution Control

Application for Permit-to-Install or Permit-to-Install and Operate

This section should be filled out for each permit to install (PTI) or Permit to Install and Operate (PTIO) application. A PTI is required for all air contaminant sources (emissions units) installed or modified after January 1, 1974 that are subject to OAC Chapter 3745-77. A PTIO is required for all air contaminant sources (emissions units) that are not subject to OAC Chapter 3745-77 (Title V). See the application instructions for additional information.

For OEPA use only:		
	[x] Installation	[ ] Request Federally enforceable restrictions
	[ ] Modification	[ ] General Permit
	[ ] Renewal	[ ] Other

1. Please summarize the reason for this permit application. This text will be in the public notice that will appear in the newspaper of the county where the facility is located.

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Application for permit-to-install and operate (PTIO) is submitted in accordance
with Paragraph 19 of the the Consent Order between the State of Ohio and Renergy,
Inc. entered in the Greene County Court of Common Pleas on April 25, 2022, Case No.
2022 cv 0201.  Attached to this PTIO application are the Best Available Technology
Evaluation required by Paragraph 20 of the Consent Order and the air toxics
modeling study required by Paragraph 21 of the Consent Order.
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Is the purpose of this application to transition from OAC Chapter 3745-77 (Title V) to OAC Chapter 3745-31 (PTIO)?

No

2. **Establish PER Due Date** - Select an annual Permit Evaluation Report (PER) due date for this facility (does not apply to facilities subject to Title V, OAC Chapter 3745-77). If the PER has previously been established and a change is now desired, a PER Change Request form must be filed instead of selecting a date here.

Due Date:	For Time Period:
Jan 1 - Dec 31, Due Feb 15	January 1 through December 31

3. **Federal Rules Applicability**

New Source Performance Standards (NSPS) *New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary Sources.*	Not affected
National Emission Standards for Hazardous Air Pollutants (NESHAP) *National Emissions Standards for Hazardous Air Pollutants are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*	Not affected
Maximum Achievable Control Technology (MACT) *The Maximum Achievable Control Technology standards are listed under 40 CFR 63 and OAC rule 3745-31-28.*	Not affected
Prevention of Significant Deterioration (PSD) *These rules are found under OAC rule 3745-31-10 through OAC rule 3745-31-20.*	Not affected
Greenhouse Gas Pollutant Prevention of Significant Deterioration (PSD) *These rules are listed under 40 CFR Parts 51, 52.*	Not affected
Non-Attainment New Source Review *These rules are found under OAC rule 3745-31-21 through OAC rule 3745-31-27.*	Not affected
112 (r) - Risk Management Plan	Not affected

These rules are found under 40 CFR 68.

Title IV (Acid Rain Requirements) Not affected
These rules are found under 40 CFR 72 and 40 CFR 73.

4. **Express PTI/PTIO** - Do you qualify for express PTI or PTIO processing?

   No

5. **Air Contaminant Sources in this Application** - Identify the air contaminant source(s) for which you are applying below. Attach additional pages if necessary. Section II of this application and an EAC form should be completed for each air contaminant source.

Emissions Unit ID	**Company Equipment ID** (company's name for air contaminant source)	**Equipment Description** (List all equipment that are a part of this air contaminant source)
TMP223646	Digestate Storage Tank	Form and extent of control to be determined

The Emissions Unit ID would have been created when a previous air permit was issued. If no previous permits have been issued for this air contaminant source, leave this field blank. If this air contaminant source was previously identified in STARShip applications as a "Z" source (e.g., Z001), please provide that identification and a new ID will be assigned when the PTI/PTIO is issued.

6. **Trade Secret Information** - Is any information included in this application being claimed as a trade secret per Ohio Revised Code (ORC) 3704.08?

   No

7. **Permit Application Contact** - Person to contact for questions about this application:

Jeff Williamson		Operations Manager
Name		Title
1156 Herr Rd	Fairborn, OH	45324
Street Address	City/Township, State	Zip Code
4192535300		jwilliamson@renergy.com
Phone	Fax	E-mail

8. **Application Attachments**

Attachment ID	Attachment Type	Description	EAC Form Type	Public Document	Trade Secret Document	Trade Secret Justification	Event Date
802893	6-24-2022 PTIO application submittal letter	Cover Letter		X			
802731	TRC emissions tech memo	Permit application attachments and supplements		X			
802868	BAT Evaluation report	Permit application attachments and supplements		X			
802869	DVT Air Toxics Modeling Study	Permit application attachments and		X			

		supplements					
802886	Application narrative	Permit application attachments and supplements		X			

DOVETAIL ENERGY, LLC
FAIRBORN, OHIO

SUMMARY

Renergy, Inc., dba Dovetail Energy, LLC, submits this application for an Ohio EPA air permit-to-install and operate (PTIO) for its existing digestate storage tank. The application will result in issuance of an air permit for a previous de minimis air contaminant source.

Dovetail Energy, LLC (Dovetail) is located at 1156 Herr Road, Fairborn, Greene County, Ohio. The facility operates as Ohio EPA Facility ID 0829065027.

Prior to this application, Dovetail had no basis or emission data to determine whether the digestate storage tank was a de minimis air contaminant source. From its construction in 2013 by Quasar Energy Group (Quasar) under a turn-key engineering, procurement, and construction (EPC) contract until 2018, the facility operated under an agricultural exemption from Ohio EPA's air permitting regulations. During their application review and site inspections that led to issuance of PTIO P0124072 for the anaerobic digester and power-production internal combustion engine, Ohio EPA and RAPCA did not identify the digestate storage tank as a source of greater than de minimis air emissions and did not request an application.

This PTIO application is submitted in accordance with Paragraph 19 of the Consent Order between the State of Ohio and Renergy, Inc. entered in the Greene County Court of Common Pleas on April 25, 2022, Case No. 2022 cv 0201. Attached to this PTIO application are the Best Available Technology Evaluation required by Paragraph 20 of the Consent Order and the air toxics modeling study required by Paragraph 21 of the Consent Order.

EMISSION ESTIMATES

Potential air emissions from the digestate storage tank were calculated based on the results of sampling conducted on June 14, 2022. The sampling methods and procedures and emissions results are described in a TRC technical memorandum entitled Flux Emissions for Renergy – Dovetail Energy Lagoon, Fairborn, OH, included as an attachment to this PTIO application. Table 1 summarizes the results of the sampling event.

Table 1. Digestate Storage Tank, Emission Test Results, June 14, 2022

Pollutant	Emission Test Results		
	lbs/hr	lbs/day	tons/year
Ammonia	0.003	0.08	0.015
Hydrogen sulfide	0.013	0.30	0.055
Methane	23.1	554	101
Nonmethane hydrocarbons	4.26	102	18.6

Notes:

1. H_2S was sampled as the representative sulfur-bearing compound
2. Annual methane emissions (101 tons) are equivalent to 2,525 tons CO2e based on methane's global warming factor of 25
3. Nonmethane hydrocarbons reported as propane

BEST AVAILABLE TECHNOLOGY

Paragraph 20 of the Consent Order requires Dovetail to submit a complete Best Available Technology Evaluation (BAT report) for the digestate storage tank to determine what measures are available to reduce emissions as required by Ohio Revised Code Chapter 3704 and rules adopted thereunder.

The complete BAT report is included as an attachment to this PTIO application.

AIR TOXICS MODELING STUDY

Paragraph 21 of the Consent Order requires Dovetail to submit a modeling study that identifies the level of emissions from the digestate storage tank needed to comply with the Ohio EPA Air Toxics Policy in accordance with Ohio Revised Code 3704.03(F)(4). The Ohio EPA Air Toxics Policy is implemented by Ohio Administrative Code (OAC) chapter 3745-114 and Engineering Guides #69 and 70.

The full air toxics modeling study report is included as an attachment to this PTIO application. The electronic modeling files will be submitted separately by electronic mail to Chris Beekman, Ohio EPA, air modeling manager.

The digestate storage tank has the potential to emit two chemicals listed under OAC 3745-114-01 and are thus regulated as air toxics contaminants – ammonia and hydrogen sulfide. By policy, Ohio EPA does not require an analysis if potential emissions are less than 1 ton per year. Potential ammonia and hydrogen sulfide are well below 1 ton per year. Methane is not regulated as an air toxic contaminant by OAC chapter 3745-114.

To comply with the Ohio EPA Air Toxics Policy, the model-predicted worst-case 1-hour impact concentration must be less than the chemical-specific maximum acceptable ground level concentration (MAGLC) at the property line and beyond.

- For ammonia, the MAGLC is 417 $\mu g/m^3$, 1-hr average. To achieve this ambient impact concentration, ammonia emissions must be less than 1.18 lbs/hr or 28.3 lbs/day. Estimated ammonia emissions are 0.08 lbs/day (0.003 lbs/hr).
- For hydrogen sulfide, the MAGLC is 33.3 $\mu g/m^3$, 1-hr average. To achieve this ambient impact concentration, hydrogen sulfide emissions must be less than 0.095 lbs/hr or 2.3 lbs/day. Estimated hydrogen sulfide emissions are 0.30 lbs/day (0.013 lbs/hr).

Technical Memorandum

Date: June 23, 2022

To: Ohio EPA

From: Dan Grabowski

Project: 487700.0000

Subject: Flux Emissions for Renergy - Dovetail Energy Lagoon, Fairborn, OH

TRC Environmental Corporation (TRC) performed a sampling test program on the lagoon site at the Dovetail Energy Facility (Dovetail) in Fairborn, Ohio on June 14, 2022. The tests were authorized by and performed for Renergy, the owner of the Dovetail Energy Facility.

The purpose of the sampling event was to determine the total hydrocarbons (THC), methane (CH_4), hydrogen sulfide (H_2S) as a representative sulfur-bearing compound, and ammonia (NH_3) emissions from the lagoon. Sampling took place over approximately 12-hours using a flux chamber, an instrumental analyzer, and Dräger tubes. The sampling was performed to support an air permit application (i.e., a Permit to Install and Operate an air emissions source) required by the Ohio Environmental Protection Agency (EPA) Consent Order. Emission flux measurements provide an estimate of the amount of target analytes being emitted from a known surface area per unit time allowing the calculation of analyte emissions from the entire lagoon per hour and per day.

Process Description: Dovetail receives hog manure and food wastes and mixes them in proportions that vary based on digester chemistry needs. The mixed slurry is then transferred to an adjacent anaerobic digester for the production of biogas which is burned on site to generate electricity. Digestate is discharged from the digester to a lagoon. The digestate is subsequently removed periodically for land application to amend agricultural land. Over time, the discharge volume from the digester is roughly equal to the volume of slurry that is supplied to it.

Dovetail collects process data including food waste dosing in gallons, hog waste dosing in tons (which is converted to gallons using a conversion factor of 7.8 pounds per gallon), and digestate removed for land application in gallons. Dovetail Energy also collects a variety of analytical data to manage digester chemistry. Dovetail operated the lagoon under normal conditions during the sampling program.

A one-day air sampling program was conducted at Dovetail Energy to gather data for the calculations. Samples were collected on June 14, 2022. Samples were collected above the lagoon surface and around the lagoon. Lagoon samples were collected in an area of the lagoon with limited crusting for most of the day. Ambient air samples were also taken for NH_3 and H_2S immediately above the lagoon surface and around the perimeter of the lagoon.

Agitation of the pond was performed prior to the testing. Pond agitation is performed before digestate is removed for land application and believed to represent the worst-case conditions for lagoon emissions. Agitation breaks up the crust, which is known to reduce volatile emissions from lagoons. Throughout the day the crust of the pond began to reform.

Sampling Approach & Execution: TRC's approach to the sampling is outlined below:

TRC utilized a Scentroid SF450 Flux Chamber to determine levels of emissions from the pond. The SF450 has a 100% solid stainless-steel construction to ensure zero cross contamination. Flotation is achieved using 4 stainless steel floats eliminating the need for rubber tubes or foam. Attachment A provides a photograph of the deployed flux chamber.

The flux chamber is set up to enclose a surface area of 240 square inches (0.155 square meters) in accordance with the manufacturer's recommendations. Zero air (sweep air) is introduced to the chamber at a known flow rate (recommended 6 lpm) to mix with the emissions. Sample is then drawn from the flux chamber at lower rate using a sampling device.

The sampling device was a J.U.M. Model 109A analyzer. This heated dual FID analyzer continuously and simultaneously measures methane (CH_4), total hydrocarbon (THC), and non-methane hydrocarbon (NMHC) concentrations.

TRC utilized Dräger pump system and tubes to analyze for NH_3 and H_2S. For NH_3 analysis, tube batch 8101711 PK 1921 with a detection limit of 0.25ppm were used. For H_2S analysis, tube batch 8101461 RA2961 with a detection limit of 0.20ppm were used.

The sampling program was initiated at approximately 7:20 AM. The test team was able to collect Dräger tube samples for NH_3 and H_2S from a slipstream off the flux chamber, however, moisture condensed in the tubes, raising concerns about interference. Subsequent Dräger tube samples for NH_3 and H_2S were collected immediately above the lagoon surface and around the perimeter of the lagoon.

At the same time, the test team began collecting samples from the slipstream off the flux chamber for the instrumental analysis of CH_4, THC, and NMHC. During the first several hours of sampling the team worked with sample flow rates and instrument range settings to obtain data that were within the calibration range. Material floating up from the lagoon also upset sampling operations. It was approximately 2:00 pm before the measurement system stabilized yielding concentrations the team believed was representative of source conditions.

Multiple Dräger tube samples were collected throughout the day, around the perimeter of the lagoon during the flux chamber testing. As noted, the first samples taken were using the Dräger pump and flux chamber. All other tube samples were grab samples of ambient air (either immediately above the surface near the flux chamber or at locations on the downwind perimeter of the lagoon) using only the Dräger pump system. There were 13 sample tubes taken for each pollutant throughout the day. Results of those samples are presented in Tables 3 & 4. A picture of the spent Dräger tubes is provided in Attachment B.

The 109A analyzer was calibrated using methane calibration gases. The sweep air was attached to the flux chamber and was set at the recommended 6 lpm to start the sampling. The flux

chamber was set on the pond and time was allowed for the chamber stabilization and air exchange residence time. The residence time is defined as the chamber volume divided by the sweep air flow rate. It typically takes three to four residence times before steady-state concentrations are reached inside the chamber and sampling can be initiated.

Testing was completed at 9:30 PM. Final calibrations were conducted at this time.

Example calculations are provided on page 6. This calculation is for the first H_2S data point at 7:20 AM. The same calculation procedures were used for all analytes.

A picture of the flux chamber sampling apparatus is provided in Attachment A.

Summary Data

Table 1, Calculated CH_4 Emissions from the 220' Diameter Dovetail Energy Facility Lagoon, Fairborn, OH						
Date	Start Time	End Time	lbs/hr (max)	lbs/hr (avg)	lbs/day (max)	lbs/day (avg)
6/14/22	1414	1514	16.57	6.41	397.80	153.86
6/14/22	1548	1752	7.94	2.16	190.50	51.91
6/14/22	1843	2130	44.76	19.79	1,074.23	475.07

Table 2, Calculated NMHC as CH_4 Emissions from the 220' Diameter Dovetail Energy Facility Lagoon, Fairborn, OH[1]						
Date	Start Time	End Time	lbs/hr (max)	lbs/hr (avg)	lbs/day (max)	lbs/day (avg)
6/14/22	1414	1514	3.55	1.34	85.15	32.08
6/14/22	1548	1752	2.13	0.87	51.08	20.81
6/14/22	1843	2130	7.10	2.74	170.47	65.84
[1]To convert NMHC emissions as CH_4 to C_3H_8, multiply the presented results by the ratio of molecular weights (1 C_3H_8 to 3 CH_4, 44/48 or 0.917.						

Table 3, Calculated H_2S Emissions from the 220' Diameter Dovetail Energy Facility Lagoon, Fairborn, OH							
Date	Start Time	End Time	ppm	lbs/hr (max)	lbs/hr (avg)	lbs/day (max)	lbs/day (avg)
6/14/22	0720*	---	0.50	0.013	0.013	0.30	0.30
6/14/22	0935	---	0.50	---	---	---	---
6/14/22	1100	---	0.20	---	---	---	---
6/14/22	1200	---	0.20	---	---	---	---
6/14/22	1230	---	<0.20	---	---	---	---
6/14/22	1440	---	<0.20	---	---	---	---
6/14/22	1600	---	<0.20	---	---	---	---
6/14/22	1700	---	<0.20	---	---	---	---
6/14/22	1800	---	<0.20	---	---	---	---
6/14/22	1900	---	<0.20	---	---	---	---
6/14/22	2000	---	<0.20	---	---	---	---
6/14/22	2100	---	<0.20	---	---	---	---
6/14/22	2200	---	<0.20	---	---	---	---

*Collected from flux chamber slipstream, all others collected from ambient air

Detection limit for H_2S is 0.20ppm

Table 4, Calculated NH_3 Emissions from the 220' Diameter Dovetail Energy Facility Lagoon, Fairborn, OH							
Date	Start Time	End Time	ppm	lbs/hr (max)	lbs/hr (avg)	lbs/day (max)	lbs/day (avg)
6/14/22	0720*	---	0.25	0.003	0.003	0.08	0.08
6/14/22	0935	---	<0.25	---	---	---	---
6/14/22	1100	---	<0.25	---	---	---	---
6/14/22	1200	---	1.0	---	---	---	---
6/14/22	1230	---	<0.25	---	---	---	---
6/14/22	1440	---	<0.25	---	---	---	---
6/14/22	1600	---	<0.25	---	---	---	---
6/14/22	1700	---	<0.25	---	---	---	---
6/14/22	1800	---	<0.25	---	---	---	---
6/14/22	1900	---	<0.25	---	---	---	---
6/14/22	2000	---	<0.25	---	---	---	---
6/14/22	2100	---	<0.25	---	---	---	---
6/14/22	2200	---	<0.25	---	---	---	---

*Collected from flux chamber slipstream, all others collected from ambient air

Detection limit for NH_3 is 0.25ppm

Example Calculations

Conversion calculations

Convert ppm_v to $\mu g/m^3$:

$$\frac{0.50\ ppm\ H_2S\ x\ 34.1\ g/mole}{24.45\ liters/mole} = 0.70\frac{g}{liter} = 0.70\frac{mg}{m^3} = 697\frac{\mu g}{m^3} = 0.70\ \frac{\mu g}{liter}$$

Emissions Flow EF_1:

$$Emissions\ Flow\ EF_1 = \frac{C_1\ X\ Q}{A}$$

Where:

EF_1 = emission rate of species ug/liter-min

C_1= measured concentration of species 1 (ppm_v converted to ug/m^3)

Q = sweep air flow rate m^3/minute

A = exposed surface area (m^2)

$$EF_1 = \frac{697\ \frac{\mu g}{meter^3} H_2S\ X\ 0.006\ \frac{meter^3}{minute}}{0.155\ meter^2} = 26.98\ \frac{\mu g}{meter^2 - minute}$$

$$\frac{lb}{day - m^2} = 26.98\frac{\mu g}{meter^2 - minute} x \left(60\ \frac{min}{hr}\right) x\ 24\frac{hr}{day} x\ \frac{1}{1000000}\frac{g}{\mu g}\ x \frac{1}{454}\frac{lb}{g} = 8.56\ x10^{-5}\frac{lb}{day - m^2}$$

Pond Area Calculation

Pond diameter is 220 feet, assume it is circular

$$Pond\ Diameter = 220\ feet\ x\ 12\ \frac{inches}{foot}\ x\ 2.54\ \frac{cm}{inch}\ x\ \frac{1\ meter}{100\ cm} = 67.06\ meters$$

$$Pond\ Radius = \frac{Diameter}{2} = 33.53\ meters$$

$$Pond\ Area = \pi\ x\ Radius^2 = \pi\ x\ 33.53^2 = 3532\ m^2$$

Emissions/day:

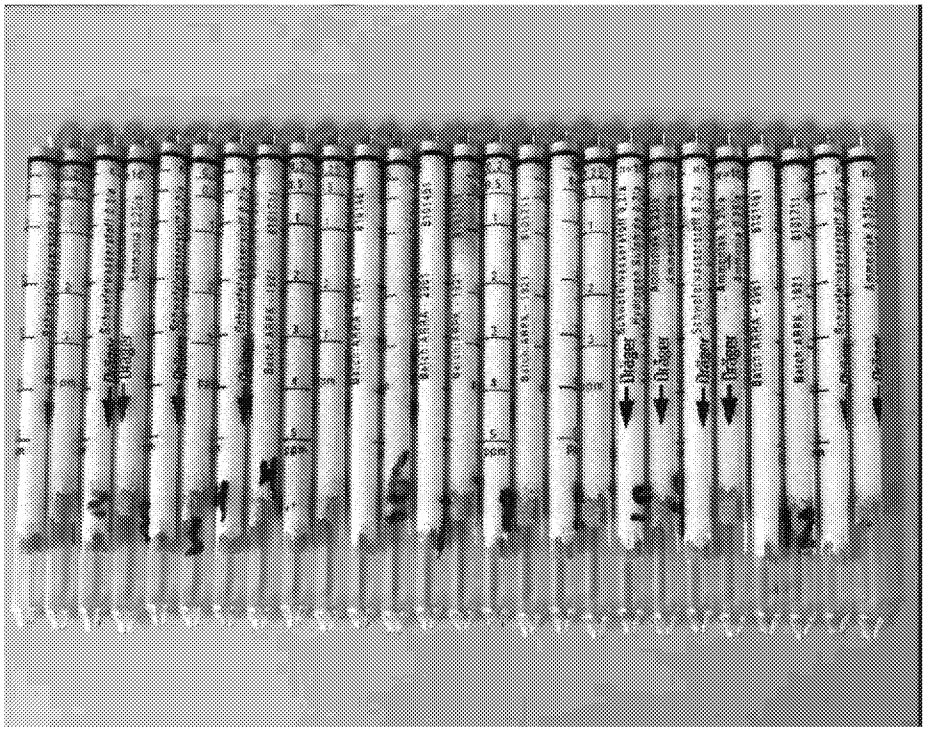
$$Pounds\ per\ day = 8.56\ 10^{-5}\ \frac{lb}{day - m^2}\ x\ 3532\ m^2 = 3.02\ x10^{-1}\ \frac{lb}{day}$$

Attachment A: Sampling Apparatus

Sample collection was performed using a Scentroid SF450 Stainless Steel Flux Chamber. The flux chamber was floated on the liquid area of the pond.

Attachment B: Sample Media

Sample collection for NH_3 and H_2S was performed at the pond and around the perimeter of the pond throughout the day and evening. Results for NH_3 were 1 ppm or less and 0.25 ppm or less for H_2S. Here is a picture of the tubes that were used for analysis.



DOVETAIL ENERGY, LLC
AIR TOXICS MODELIING STUDY

This air toxics modeling study is submitted in accordance with Paragraph 21 of the Consent Order between the State of Ohio and Renergy, Inc. entered in the Greene County Court of Common Pleas on April 25, 2022, Case No. 2022 cv 0201.

BACKGROUND

Renergy Inc. operates an anaerobic digester at its Dovetail Energy, LLC facility east of the City of Fairborn in Bath Township, Green County, Ohio (see Figure 1). The facility is located at 1146 Herr Road. An integral part of the operation is a 220-foot diameter in ground, open top storage tank or basin that receives and holds digestate from the anaerobic digestion of manure and food waste materials. Digestate is held in the storage tank until it is removed for land application.

The digestate storage tank is possibly a greater-than-de minimis source of ammonia and hydrogen sulfide emissions. Renergy is required by consent order to submit a permit-to-install and operate (PTIO) application. Renergy is required by the same consent order to determine if the storage tank is a source of other regulated pollutant such as VOC, hydrogen sulfide (H_2S), and methane.

The Ohio EPA has requested that Renergy conduct an air quality modeling study of ammonia emissions from the digestate storage tank. Renergy is also presenting modeling results for hydrogen sulfide. Renergy has previously submitted a modeling protocol to the Ohio EPA describing a proposed procedure for evaluating the predicted impact of ammonia. This memorandum documents the modeling analysis and results due to a hypothetical emission rate of 1 pound per hour of ammonia. Because of the linear relationship between the modeled emission rate and model-predicted impact, results are also presented for hydrogen sulfide based upon the ammonia results.

OHIO EPA HEALTH STANDARD FOR AMMONIA

Ammonia is an affected toxic air contaminant under OAC chapter 3745-114 and is hypothetically assumed to have potential emissions greater than one ton (2,000 lbs) per year (1 tpy). Therefore, an approvable PTIO application for the digestate storage tank must include a demonstration of compliance with Ohio EPA's air toxics regulation as described in Ohio EPA engineering guides #69 and 70.

Ammonia has a defined Maximum Allowed Ground Level Concentration (MAGLC) of 417 micrograms per cubic meter, 1-hour average (based upon a ACGIH TLV- TWA = 25 ppm or 17.5 mg/m^3 with a MAGLC for continuous operation= 17,500 $\mu g/m^3 \div 42$). Compliance with this standard is demonstrated by use of an air dispersion model using observed meteorological conditions representative of the location of the facility.

MODELING PROCEDURES

For the air quality analysis, the following air quality modeling procedures are used and approved by the Ohio EPA.

- Use of the latest version of the USEPA AERMOD dispersion model (V21112).

- Use of a five-year meteorological dataset (2017-2021) from the Dayton International Airport as processed by the Ohio EPA using the latest version of AERMET. This airport is located about 12 miles west of the plant site and the nearest source of verified surface and upper air data.
- Use of all regulatory default model options.
- Receptors were placed on the facility boundary with a spacing of 50 meters out to a distance of greater than 750 meters (50-meter spacing) from the facility boundaries (see Figure 2). Receptor elevations were obtained using the USEPA's AERMAP terrain processor with an applicable National Elevation Dataset.
- The digestate storage tank was modeled as a circular area source with a release height of 5 feet (1.5 meters) above ground level and a diameter of 220 feet (67 meters). See Figure 2 for the location in relation to facility boundaries.
- For the initial analyses, a hypothetical unit-response emission rate of 1 pound per hour (24 lbs/day) was used and divided equally over the open surface area of the tank (38,013 ft^2 or 3,532 m^2). The unit-response emission rate was entered into the area source model as 3.57E-05 grams/square meter per second.
- The model was used to identify the maximum 1-hour average predicted impact based on the unit-response emission rate. With this result further calculations can be made to identify the maximum emission rate of ammonia from the basin that could be released while remaining in compliance with the MAGLC.

MODEL RESULTS FOR AMMONIA

For a 1 lb/hr emission rate (3.57E-05 g/m^2-sec), the model predicted a maximum 1-hour impact of 350.9 $\mu g/m^3$ along the property line due south of the digestate storage tank. Predicted air quality modeling results when using the AERMOD dispersion model are linearly correlated to the emission rate assumed. Therefore, to stay below the ammonia MAGLC, emissions from the digestate storage tank would need to be limited to the following hourly rate.

= 417 $\mu g/m^3$ (MAGLC) ÷ 350.9 $\mu g/m^3$ (maximum impact) x 1 lb/hr (modeled rate) < **1.18 lb/hr**

Renergy has retained TRC Environmental to conduct surface flux measurements of ammonia from the digestate storage basin. This sampling effort has quantified an ammonia emission rate of 0.08 lb/day or 0.003 lb/hr from the surface. The measured emission rate is nearly 400 times less than than the maximum rate (1.18 lb/hr) the model demonstrated would meet the MAGLC for ammonia.

MODEL RESULTS FOR HYDROGEN SULFIDE

Hydrogen sulfide has a defined MAGLC of 33.3 micrograms per cubic meter, 1-hour average (based upon a ACGIH TLV- TWA of 1 ppm or 1.4 mg/m^3 with a MAGLC for continuous operation= 1,400 $\mu g/m^3$ ÷ 42). Therefore, to stay below the hydrogen sulfide MAGLC, emissions from the digestate storage tank would need to be limited to the following hourly rate.

= 33.3 $\mu g/m^3$ (MAGLC) ÷ 350.9 $\mu g/m^3$ (maximum impact) x 1 lb/hr (modeled rate) < **0.095 lb/hr**

The TRC sampling effort quantified a hydrogen sulfide emission rate of 0.30 lb/day or 0.013 lb/hr from the surface. This measured emission rate is approximately one order of magnitude less than the maximum rate (0.095 lb/hr) the model demonstrated would meet the MAGLC for hydrogen sulfide.

Figure 1. General Facility Location

Figure 2. Receptor Locations and Location of AD Digestate Storage Tank

Best Available Technology Evaluation to Reduce Emissions from the Digestate Storage Lagoon at the Dovetail Energy, LLC

facility located at

1156 Herr Road, Fairborn, Greene County, Ohio
Ohio EPA Facility ID 0829065027

June 24, 2022

Azura Associates International Inc.
Waterloo, ON Canada

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AZURA
WASTEWATER TO CLEANTECH

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1 Introduction

Azura Associates International Inc. (Azura) was retained by Renergy Inc. (Renergy) to prepare a Best Available Technology evaluation ("BAT Report") for the digestate storage lagoon at Renergy's Dovetail facility located at 1156 Herr Road, Fairborn, Greene County, Ohio (Ohio EPA Facility ID 0829065027).

This BAT report examines what measures are available to reduce the air emissions from the lagoon. In preparing this evaluation report, Azura reviewed the following documents to determine the requirements for a BAT Report as required under Ohio regulation:

- Engineering Guide #46, Ohio EPA, Office of Air Pollution Control, Engineering Section (December 1983);
- BAT Requirements for Permits Issued on or After February 7, 2014 (February 2014); and
- Engineering Guide #89: Determining When a Best Available Technology Cost-Effectiveness Study is Needed (January 2016).

This BAT Report will consider procedures, operating practices, process measures, as well as both passive and active measures to minimize emissions from the lagoon. These possible interventions include the physical modification and replacement of the digestate storage lagoon.

Technology and equipment vendors continue to provide conceptual level cost estimates and this report may be updated if new or different information becomes available. Where complete design or performance information has not been available, we have endeavoured to make reasonable assumptions and provide engineering estimates where possible and indicate where we have done so.

2 Overview

Much of the food and organic waste generated in North America is directed to landfill. These wastes breakdown over time in the landfill and release methane, a potent greenhouse gas, to the atmosphere. Methane has 25x the global warming potential of carbon dioxide.

The bioenergy system at the Dovetail facility uses a similar anaerobic digestion process, but in a controlled environment inside the digester tank, to convert food waste and organic waste into methane-rich biogas. This biogas is typically used to produce renewable electricity. The remaining digested slurry is called "digestate". Digestate is used as a valuable soil amendment and fertilizer that contains a mixture of nitrogen, phosphorus, and other nutrients.

Anaerobic digestion is a common process that has been occurring in nature for millennia. Using anaerobic digestion to convert food and other organic wastes to renewable bioenergy has been in practice for more than 100 years. The fundamental science of anaerobic digestion is well known and has been applied in engineering practice at sewage treatment plants for decades. In a 2015 survey, the U.S. EPA reports that there are more than 5,000 sewage treatment plants in the United States using anaerobic digestion. That same study reports that there are also more

than 150 stand-alone food waste anaerobic digestion facilities that were confirmed to be operational (EPA, 2018)[1].

3 Process Information

As with other biological transformations like beer-making, backyard composting, and growing crops on farms, the Dovetail bioenergy site seeks to optimize and intensify what is otherwise an everyday natural process. The anaerobic digester is a facility designed to accelerate anaerobic biodegradation and produce a methane-rich biogas stream.

3.1 Dovetail Bioenergy Facility Description

The Dovetail facility is co-located adjacent to the Pitstick family pork farm just east of Fairborn, OH, about 15 miles east of Dayton, OH. This facility was constructed by Quasar Energy Group.

The basic design details of the site are as follows:

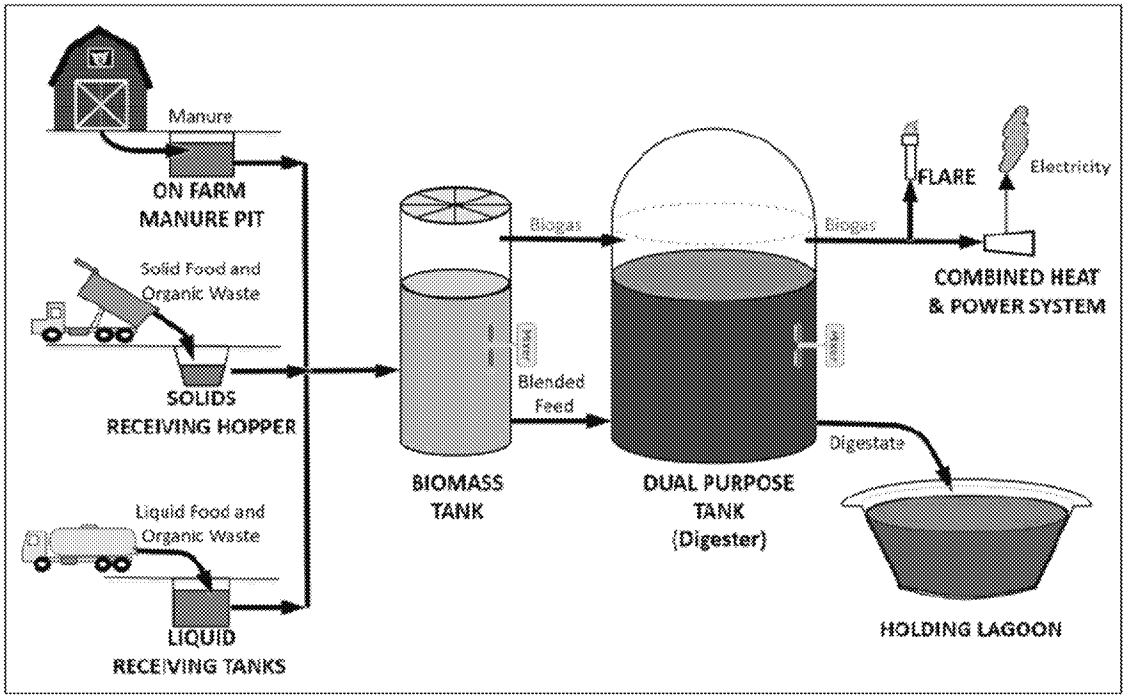
- Feedstock receiving;
- Biomass tank: above ground, cylindrical, mixed, blended feedstock;
- Dual-Purpose tank (digester): above ground, cylindrical, mixed, heated;
- Biogas storage: Yes, dual flexible cover membrane system on Dual Purpose tank; and
- Digestate storage lagoon: open-top circular concrete tank, partially below ground.

3.1.1 Process Description

Figure 1 shows a simplified schematic of the bioenergy production process at the Dovetail site. The various solid and liquid feedstocks are off-loaded into receiving tanks or the solids hopper before being ground or macerated, and then transferred to the Biomass Tank.

[1] US EPA, *"Anaerobic Digestion Facilities Processing Food Waste in the United States in 2015"*, EPA, p.2, 2018.

Figure 1: Simplified schematic of the Dovetail waste-to-energy process.



Mixers installed in the digester keep the contents well mixed. These mixers allow the Biomass Tank to be treated as a continuous stirred-tank reactor (CSTR) for process design and operation purposes. The Biomass Tank contents are warmed by pumping the blended feed material through an external heat-exchanger. The liquid level in the Biomass Tank varies as fresh feed material is received throughout the week and the blended feedstock is transferred to the Dual Purpose Tank.

Feedstocks are typically received in truck-load quantities, during the day, Monday through Friday, and transferred to fill the Biomass Tank that same day. Blended feed from the Biomass Tank is pumped to the Dual Purpose Tank every 30-minutes, 24/7, so that the Dual Purpose tank is fed a consistent amount over the entire week.

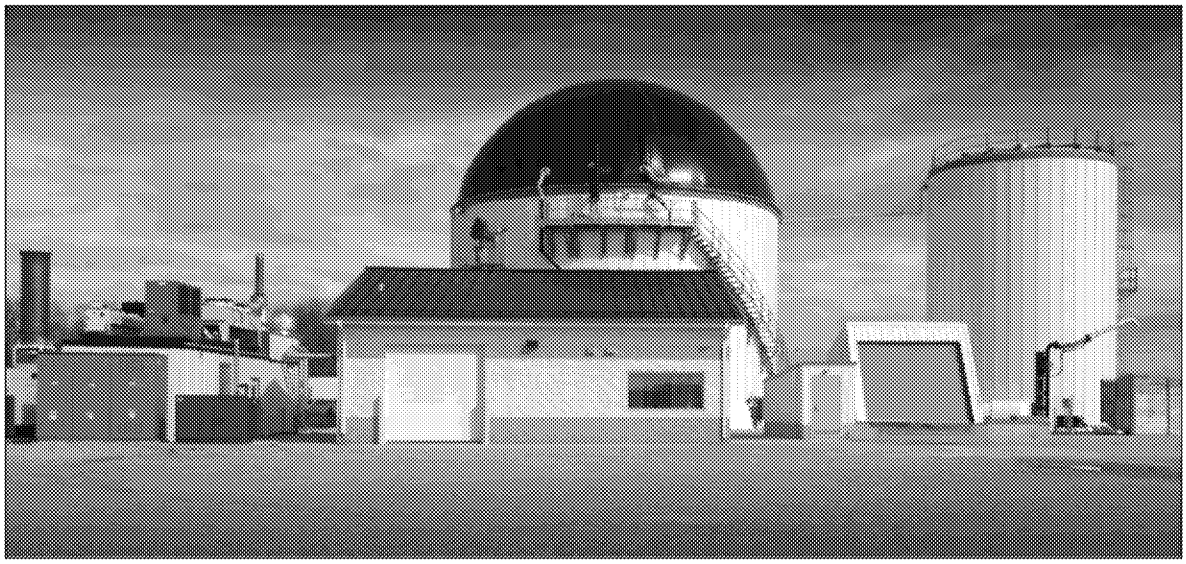
The 750,000 gal Dual Purpose Tank is both the main anaerobic digester tank and also the biogas storage location. Like the Biomass Tank, the Dual Purpose Tank is a heated, above-ground, cylindrical tank and is also equipped with several through-wall mounted mechanical mixers designed to keep the contents well mixed. These mixers allow the Dual Purpose Tank to be treated as a CSTR for process design and operation purposes.

The Dual Purpose Tank contents are warmed by pumping the digester contents, called "digestate" through an external heat-exchanger. The liquid level in the Dual Purpose Tank can be varied by the process operators.

The Dovetail site uses a dual-membrane biogas storage system. With this type of system an inner, unseen, gas membrane inflates or deflates in response to the biogas generation rate and the biogas withdrawal by the operation of the CHP unit. External to the gas membrane is a weather-membrane. An air blower maintains a slight pressure on the interstitial space between the weather membrane and the gas membrane, this air pressure inflates the weather membrane which gives the bioenergy digester the common dome shaped appearance.

A photograph of the site is shown in Figure 2. On the right-hand side are the below-ground receiving tanks and the above-ground Biomass Tank. In the middle of the photograph is the Dual Purpose Tank with the black, outer weather-cover of the biogas storage dome visible. The CHP and biogas flare are located near the left side.

***Figure 2**: Dovetail site photograph.*



A portion of the digestate is withdrawn from the Dual Purpose tank each day and pumped to the storage lagoon. The lagoon is a large, circular, concrete tank, shown in Figure 3. The lagoon is approximately 220 feet in diameter, built partially below grade, and has an open surface area of approximately 38,000 ft^2. The lagoon has a total volume of approximately 4.0 Mgal and a working volume of 3.1 Mgal.

Figure 3: *Top-View of the open-topped digestate storage lagoon (left). Black circular domed anaerobic digester pictured (right).*

The digestate storage lagoon can receive up to 50,120 gal per day of anaerobically digested slurry material, called "digestate". Digestate typically contains between 2% to 10% dry solids.

The digestate is held in the storage lagoon until it can be land applied as part of seasonal land applications campaigns in the spring and fall.

3.1.2 Steady State vs. Batch

Renergy's digestate lagoon operates in a semi-batch mode. The lagoon is slowly filled over several months and then rapidly emptied over a number of weeks during the land application campaign. The digestate lagoon typically operates in one of two general operating modes:

1. **Filling (Winter and Summer)**

For most of the year the digestate lagoon is in 'filling' mode which typically takes place during the crop growing season in the summer and the cold or wet winter months.

2. **Land Application (Fall and Spring)**

During the land application season, Renergy removes the contents of their digestate lagoon and applies the digested material to nearby farmland as a soil amendment and fertilizer.

4 Emissions Information

4.1 Pollutants Emitted

The pollutants that could be emitted from the digestate lagoon include the residual biogas remaining in the bulk slurry when the digestate is transferred to the lagoon and any remaining undigested volatile compounds. The major components of biogas are methane (CH_4) and carbon dioxide (CO_2). Biogas normally consists of 50-70 percent methane and 50-30 percent carbon dioxide.

In addition to percentage-range concentrations of methane and carbon dioxide, biogas can normally contain parts per million (ppm) range concentrations of other trace gases such as:

- hydrogen sulfide (H_2S) and other sulfur compounds;
- ammonia (NH_3) and other amines; and
- volatile fatty acids (VFAs) and other non-methane hydrocarbons (NMHCs).

4.2 Concentrations

Renergy retained TRC Environmental Corporation (TRC) to sample and determine the emissions from the Dovetail lagoon. Using a flux-chamber method, TRC conducted the field investigation on June 14, 2022. The concentration ranges measured during the field investigation are summarized in Table 4.1.

Table 4.1: *Air Emission Concentrations Measured June 14, 2022.*

Pollutant	Concentration
Ammonia	< 0.25 – 1 ppm v/v
Hydrogen Sulfide	< 0.20 – 0.50 ppm v/v
Methane	44 – 3,800 ppm v/v
Non-methane Hydrocarbons	18 – 605 ppm v/v
Note: TRC Environmental Corporation, *Flux Emissions for Renergy - Dovetail Energy Lagoon, Fairborn, OH*, June 23, 2022.	

4.3 PTE – Uncontrolled Potential to Emit (PTE)

TRC provided emission test results in Table 1 of the June 24, 2022 PTIO application. The amounts and annual total are presented in Table 4.2.

Table 4.2: *Air Emission Test Results (Measured June 14, 2022).*

Pollutant	Tons per year
Ammonia	0.015
Hydrogen Sulfide	0.055
Methane	101
Non-methane Hydrocarbons	18.6
Annual Total:	**120 tons per year (rounded from 119.67)**
Note: Ohio EPA PTIO Application - A0072006	

4.4 Assumptions

Throughout this BAT Report the following general assumptions have been made about the digestion and lagoon systems:

- **Consistent feed** – any significant change in the feedstock can alter the composition of the digestate and hence change the emission rate.
- **Consistent temperature** – this report assumes the observed emissions do not change over time or over the course of the year in response to weather of other environmental factors. This is a conservative assumption as our expectation is that the emissions will increase during hot weather, and then decrease through the winter and cooler shoulder seasons.

5 Exhaust Data

5.1 Ventilation System

There is no ventilation system currently installed or operating on the digestate lagoon.

5.2 Egress Point Data

The emission source for the exhaust can be classified as either:

- Stack; or
- Fugitive.

For the purposes of this BAT study, the digestate lagoon is considered a fugitive source as the large open lagoon surface does not have a single emission point source. Rather, emissions can be released across the entire lagoon surface.

5.3 Airflow

The airflow associated with the storage lagoon is unknown. There is no mechanical air handling system associated with the digestate lagoon. The airflow is the ambient air blowing naturally over the lagoon surface as subject to local weather patterns.

5.4 Make-up Air for Ventilation

The lagoon is located outdoors so no engineered make-up air source is provided.

5.5 Capture

The biogas produced during the anaerobic digestion process is captured by the gas-membrane within the double-membrane digester dome. This captured gas is combusted in the CHP or in the flare.

No emissions are captured from the storage lagoon.

5.6 Exhaust System

Renergy's digestate lagoon is a fugitive emission source without a point-exhaust system.

6 Control Technology Options

This study reviewed the available emission control technologies in practice today for tanks and lagoons storing digestate. This review encompassed a variety of technologies used to mitigate emissions from existing open digestate tanks, up to and including new construction for above ground tanks or earthen in-ground lined storage lagoons.

Based on our review, the available options can generally be classified as follows:

Option 1: Procedures, operating practices, and process measures;

Option 2: Retrofitting existing lagoon; and

Option 3: New construction.

The three types of available options are classified by their ability to reduce or eliminate emissions from the storage lagoon, as summarized in Table 6.1:

Table 6.1: *Emission Control Technology Framework.*

		Emission Reduction	Emission Elimination
Option 1	Procedures, operating practices, and process measures	Technically Feasible	Not Feasible
Option 2	Retrofitting existing lagoon	Technically Feasible	Not Feasible
Option 3	New construction	Not Practical	Technically Feasible

Based on discussions with several vendors, it was determined that there were no technically feasible options to eliminate emissions from the existing lagoon using a gas-tight cover. The available gas-tight cover technologies require the use of a new, purpose-build tank or lagoon to incorporate the cover and gas collection system.

All the available cover options for the existing lagoon would have to be non-gas tight, and so could only be used to reduce the emissions, though not eliminate them.

The following sections briefly describe the different approaches considered under each of the three possible odour control classes. The feasible approaches will be evaluated for cost and effectiveness.

6.1 Option 1: Procedures, Operating Practices, and Process Measures

The following options were considered to reduce the air emissions from the digestate storage lagoon. Note that none of these interventions are expected to completely eliminate the potential emissions.

- Natural crust cover;
- Controlled degassing.

6.1.1 Natural Crust Cover

Some literature has indicated the formation of a natural crust on manure storage lagoons has served to reduce the emissions from those lagoons. Using a natural crust reduces the available surface area for ammonia emissions. Lagoons with dairy manure tend to have thick crusts, while hog manure and food waste digestate lagoons tend to form thin crust, or no crust at all. The performance of natural crust covers appears to be highly variable.

Not feasible due to unreliable performance.

6.1.2 Controlled Digestate Degassing

The Renergy sites use a single-stage anaerobic digestion system. As a CSTR reactor, the digestate exiting the Dual Purpose tank contains: 1) dissolved and very small biogas bubbles in the bulk fluid, 2) active anaerobic biomass, and 3) a small amount of non-degraded food waste. A secondary anaerobic digester placed in series with the existing Dual Purpose tank would allow more of the food waste to be degraded before the digestate entered the lagoon.

Since this secondary-digester tank approach is equivalent to constructing a new covered lagoon or covered secondary digester tank, the new construction options are discussed in section 6.3.

Not technically feasible as an operating practice; is considered under Option 6.3: New Construction.

Table 6.2: *Technical Information for Potential Emission Reduction Options Considering Procedures, Operating Practices, and Process Measures.*

Type	Air Pollutant Emission Reduction Effectiveness (%)	Life Expectancy	Technically Feasible
Option 1: Procedures, Operating Practices, and Process Measures			
Degassing Storage	(Considered under Option 6.3)		No
Note: N/D – no data available.			

6.2 Option 2: Emission Reduction with the Existing Digestate Lagoon

Non-gas tight cover options were explored for retrofitting the existing tank to reduce emissions.

6.2.1 Natural Covers

Straw Cover: Bio-covers, also called straw covers, are a simple lagoon cover made from straw layer, usually 4 to 12 inches thick. Straw is blown over the lagoon surface which induces the formation of crust.

Reports on the potential for emission reductions are quite variable, ranging from 25 to 90%.

Not feasible due to unreliable performance.

Perlite: Perlite is often viewed as unsuitable for lagoon covers as it is lightweight and easily blown away by strong winds.

Not technically feasible.

Expanded Clay Aggregates (ECA): Commonly known as "Clay Balls", expanded clay aggregates are reported to be excellent floating manure lagoon covers. There is no North American manufacturer ECA materials. Importing floating clay balls from Europe can add considerably to the reliability and cost of this option. Short-term supply of ECA clay balls is quite uncertain and is not guaranteed within the next 12 months.

Not technically feasible due to poor availability within the next year.

Macrolite®: Macrolite is a similar material to traditional Expanded Clay Aggregates with an effective emission reduction of approximately 60%. This product can only be imported. No available vendors were identified capable of supplying within the next 12 months.

Not technically feasible due to poor availability within the next year.

6.2.2 Synthetic Covers

Geotextile: Geotextile covers are a permeable non-gas tight cover made of either woven or non-woven fabric materials that sit on the surface of lagoons. Geotextile covers have longer lifespans than straw bio-covers, lasting from 3 – 5 years. The emission mitigation effectiveness of geotextile covers spans a wide range in the literature, with the reduction effectiveness for

some pollutants ranging from 0 to 45%. Vendors have expressed concern regarding the structural integrity of this design. Low end potential performance (0%) is also concerning and is not suitable as a sole primary emission control technology.

Not feasible due to unreliable performance.

Floating Plastic Hex: Floating plastic hexes are dinner-plated sized hexagonal plastic covers that float in the lagoon surface. The hexes move freely on the lagoon surface and largely tend to 'lock' into position to maintain the cover during strong winds. The hexes rest close to each other and are excellent at reducing the surface area available for emissions. The hex installation does have an exposed liquid surface between the floating hexes and the circular tank wall. This product is manufactured in North America, are light weight, and reported to have excellent durability.

Feasible.

Floating Plastic Balls: Plastic balls can be floated on the surface to form a semi-continuous cover, reducing the surface area of liquid exposed to the air, thus reducing emissions. Long-term integrity of the cover can be disrupted by strong winds. Vendors recommend hexes over plastic balls due to their enhanced surface area coverage and lock-in-place surface structure.

Not feasible due to unreliable performance.

Floating Plastic Sheet: The floating plastic sheet rises and falls with the digestate levels in the lagoon. The design is generally not suitable for lagoons with significantly varying liquid levels.

Not feasible due to the large change in liquid level during operations.

Tensioned Fabric or Suspended Plastic: A popular design in Europe, suspended plastic covers involve a pole being erected in the centre of the lagoon extending up several feet into the air. A non-gas tight cover is fixed to the side of the digester sloping upwards towards the center-pole. This cover design is not suitable for lagoons exceeding 130 feet in diameter due to the strength of the plastic being insufficient to withstand strong winds and heavy winter snow loads.

Not feasible due to large existing lagoon size.

6.2.3 Constructed Emission Reduction Covers

Floating Modular Cover: The floating modular geomembrane cover spans most of the surface area of a digestate storage lagoon, leaving a space of 1 to 2 feet around the edge of the concrete lagoon to protect the geomembrane from wear and tear. This design is used across North America and in Northern climates. The expected lifetime of geomembrane commonly average around 20-25 years.

Feasible.

Steel, Wood, Aluminum, Concrete: Rigid wooden, steel, and aluminum covers are durable and effective at reducing emissions but involve significant material, design, and installation efforts. Rigid covers can last between 15 and 50 years depending on the material. Based on

discussions with vendors, it is not technically feasible to retrofit the existing lagoon using a constructed cover of steel, wood, or aluminum due to geotechnical and structural engineering concerns. The existing concrete lagoon is not designed to support a constructed roof, nor could it withstand the additional wind, rain, and snow loads generated by the very large surface area of the lagoon.

Not feasible.

Table 6.3: *Technical Information for Potential Emission Reduction Options that Reuse Dovetail's Digestate Lagoon.*

Type	Air Pollutant Emission Reduction Effectiveness (%)	Life Expectancy	Technically Feasible
Option 2: Emission Reduction using the Existing Digestate Lagoon			
Natural Covers			
Straw (Biocover)	40 – 90	Up to 6 months	No
Perlite	30 – 93	<10 years	No
Clay Balls – ECA	90	<10 years	No
Clay Balls – Macrolite®	60	<10 years	No
Synthetic Covers			
Floating Geotextile	0 – 65	3 – 5 years	No
Floating Plastic Hexes	VOC removal of 80-90%	Up to 25 years	Yes
Floating Plastic Balls	N/D	Up to 25 years	No
Floating Plastic Sheet	60-78	5 – 10 years	No
Tensioned Fabric Cover	95%	<10 years	No
Constructed Covers			
Floating Modular Cover	95%	10 – 15 years	Yes
Steel, Wood, Aluminum, Concrete Covers	ND	>10 years	No
Note: N/D – no data available. 'Air Contaminant Emission Reduction' as used by some vendors refers generally to 'odor' as the combined total emissions unless another air contaminant is explicitly specified.			

6.3 Option 3: New Digestate Lagoon with Emission Elimination

Two types of new digestate storage lagoons were considered for Option 3. Both options include a fully gas-tight cover. The new storage lagoon could be constructed in one of two ways:

1. **Earthen Lagoon** – consisting of an earthen lagoon with a synthetic liner and a floating gas tight cover. The floating cover would travel up and down as the lagoon was filled and emptied.

2. **Above-Ground Lagoon** – this storage option is likely to be a cylindrical, above ground tank with a gas-tight cover. This design is similar to the existing Dual Purpose digester tank.

6.3.1 Earthen Storage

Earthen Lagoon w/ Center Post: In this option the new lagoon would be constructed similar to the European design, incorporating a center-post to support a suspended cover. The new lagoon would be equipped with a synthetic double-liner system.

Feasible.

Earthen Lagoon w/ Floating Cover: In this option the new lagoon would be constructed with a floating synthetic cover. The cover would rise and fall as the lagoon if filled and emptied. The new lagoon would be equipped with a synthetic double-liner system.

Feasible.

6.3.2 Above-Ground Storage

Above-Ground Lagoon – this storage option consists of a cylindrical, above ground tank with a gas-tight aluminum cover.

Feasible.

Table 6.4: *Technical Information for Potential Emission Elimination Options that Involve Construction of a New Lagoon.*

Type	Air Pollutant Emission Reduction Effectiveness (%)	Life Expectancy	Technically Feasible
Option 3: New Build Construction			
In-Ground Earthen Lagoon *(w/ geosynthetic double liner)*	100	20 years	Yes
Above-Ground Storage Tank *(w/ geosynthetic double liner)*	100	20 years	Yes
Above-Ground Storage Tank *(w/ Aluminum Dome)*	100	> 25 years	Yes

Tables 6.1 through 6.4 showed the relevant information related to:

- **Pollution Prevention** – Prevention and operational initiatives considered to reduce, reuse, or recycle emissions from the emission unit.
- **Technical Feasibility** – What technologies are feasible to control the pollutants from the emission unit.
- **Design Efficiency** – What are the technologies design capture and control efficiencies?

After the complete list of emission control options was produced, the technically infeasible control options were ruled out. The remaining options were summarized in the following section to include cost estimates for the technically feasible emission control options and include information related to 1) initial capital costs, 2) operational costs, 3) annualized costs, and 4) costs per ton of emissions removed.

7 Cost Estimates

Cost estimates for the digestate lagoon emission control options deemed technically feasible are provided in this section of the BAT report. Tables 7.1—7.3 contain the initial capital cost, annual operating cost, and the total annualized cost.

As the emission interventions considered for the Dovetail site are custom-engineered solutions, there is insufficient detail at this conceptual stage of the option development to prepare a fully itemized cost breakdown in accordance with the Ohio EPA's Office of Air Pollution Control Engineering Guide #46. Engineering Guide #46 provides direction on how to select or evaluate emission requirements based on Best Available Technology using the capital cost (initial first cost), annualized cost ($/yr), and cost effectiveness ($/ton emission removed).

Where possible, two vendor quotes were included and assessed for each feasible control technology. Comments were also made regarding the detailed nature of the quotes for each control technology (i.e., does the system come turnkey, or are some components or accessories required but not included in the quote?).

Some of the cost information, particularly for the 'new build' options, provided in this report are relative, order-of-magnitude costs based on published information, informal discussions with vendors, or engineering estimates based on past project experience. These costs do not yet account for the full product life cycle, including design, ancillary equipment, installation, or operational costs such as power requirements, or any periodic material disposal costs.

***Table 7.1**: Option 1 Cost Estimates for Process and Operations Interventions to Reduce Emissions.*

Type	Initial Capital Cost ($)	Annual Operating Cost ($)	Annualized Cost (USD$)	Emission Reduction (tons/yr)	$/ton
Note: No feasible options were identified.					

Table 7.2. *Option 2 Cost Estimates for Emission Reduction Efforts Using the Existing Lagoon*

Type	Initial Capital Cost ($)	Annual Operating Cost ($)	Annualized Cost (USD$)	Emission Reduction (tons/yr)	$/ton
Floating Plastic Hexes	[redacted]	[redacted]	[redacted]	102	[redacted]
Floating Modular Cover	[redacted]	[redacted]	[redacted]	111	[redacted]
Note: [a] = Vendor Budgetary Quote [b] = Vendor Email Pricing [c] = Vendor Verbal Pricing [d] = Engineering Estimate					
Note: Supporting information from technology vendors shown in Appendix A.					

Due to the conceptual level of the lagoon designs for the new construction options, the mid-point of the vendor cost estimates was used. The preliminary costs for the new in-ground and above-ground storage lagoons are provided in Table 7.3.

Table 7.3: *Option 3 Cost Estimates for Emission Elimination Using New Lagoon Construction*

Type	Initial Capital Cost ($)	Annual Operating Cost ($)	Annualized Cost (USD$)	Emission Reduction (tons/yr)	$/ton
In-Ground Earthen Lagoon *(w/ geosynthetic double liner)*	[redacted]	[redacted]	[redacted]	120	[redacted]
Above-Ground Storage Tank *(w/ geosynthetic double liner)*	[redacted]	[redacted]	[redacted]	120	[redacted]
Above-Ground Storage Tank *(w/ Aluminum Dome)*	[redacted]	[redacted]	[redacted]	120	[redacted]
Note: [a] = Vendor Budgetary Quote [b] = Vendor Email Pricing [c] = Vendor Verbal Pricing [d] = Engineering Estimate					
Note: Supporting information from technology vendors shown in Appendix B.					

8 Conclusions

The technologies considered ranged in annualized cost between [redacted] to [redacted] with an effectiveness ranging between 10% and 100% depending on the type of cover design.

The emission reduction technology with the lowest investment cost per ton of air pollutant removed was the floating hexagonal manufactured modular covers with a cost of [redacted] of emissions reduced.

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Appendix A

Option 2 Supporting Information:

Emission Reduction with the Existing Digestate Lagoon

Quote

Southeastern Tank, Inc.
60 Vesta Road
Lebanon, TN 37090

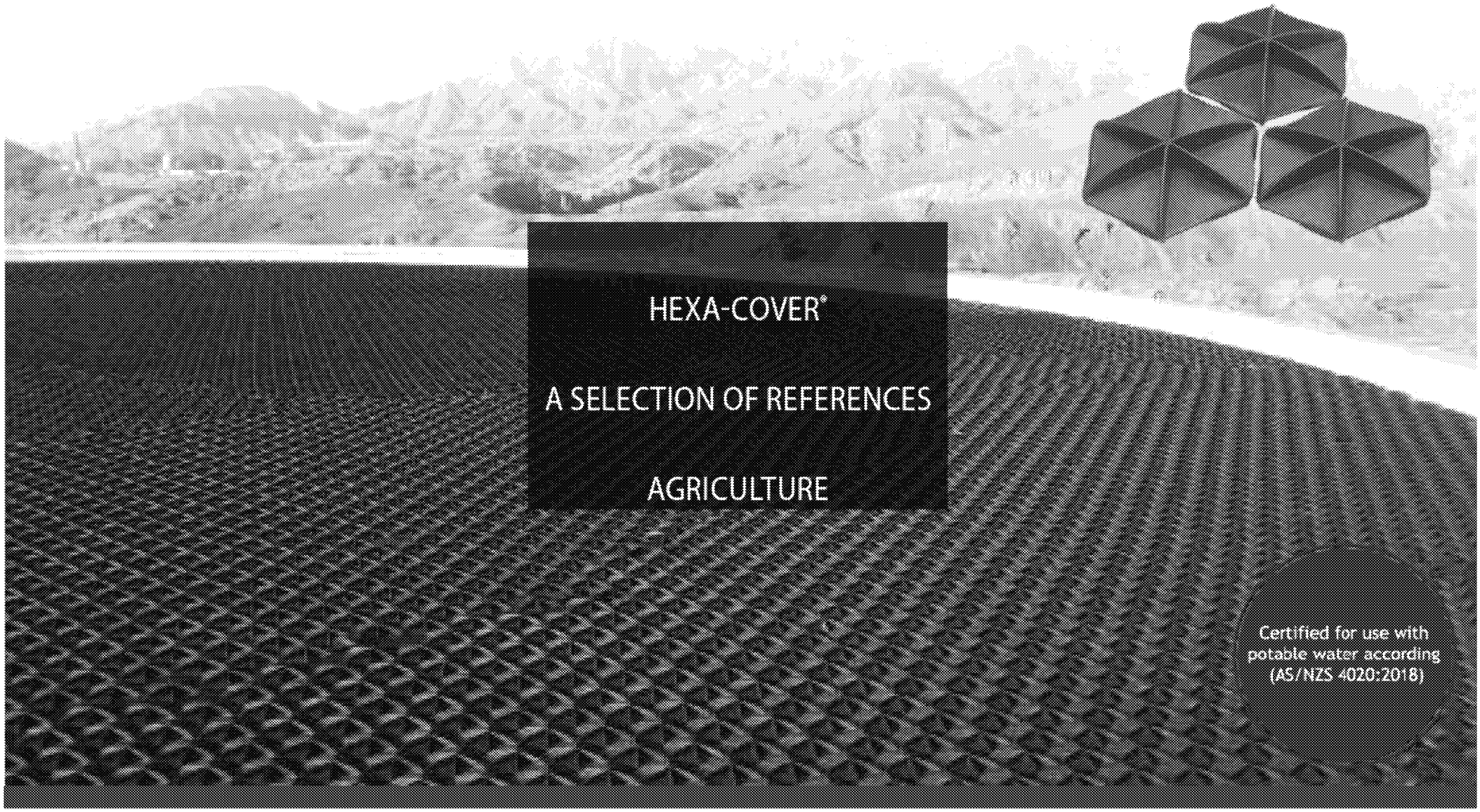
DATE	6/14/2022
QUOTE #	Azura

Client
Azura Associates
38,000 sq ft in Fairborn, Ohio

QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
1.00	38,000 sq ft of Hexacover delivered to Fairborn, Ohio 45324	[redacted]	[redacted]
	Quote is valid for 30 days.		
QUOTED BY:		SubTotal	[redacted]
Freight is estimated. Actual freight costs will be billed.		Freight	included
Sales Tax added to parts sales unless a Tax Exemption Certificate is on file.	Tax Rate		
		Total	[redacted]

***A surcharge of 3% will be added to any total if payment is by credit card.**

HEXA-COVER®



HEXA-COVER®

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AGRICULTURE

Certified for use with potable water according (AS/NZS 4020:2018)

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www.hexa-cover.com • info@hexa-cover.dk

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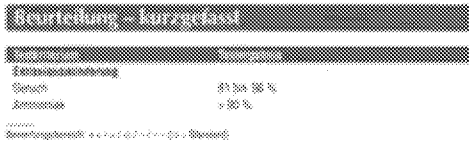
Tested by DLG, Germany



95% reduction of odor and emission

Austria
A-2245
A-3123
A-3281

Bulgaria
BG-7400 (1.800 m² slurry tank)

Canada
Wheatly, ON

Chile

A total of 115.000 m² slurry lagoons for market leading processing company

Croatia
HR-31000
HR-31216
HR-21324
HR-31325 (1.200 m² slurry tank)
HR-31326
HR-31431
HR-32100

Czech Republic

CZ-182 00	CZ-252 62	CZ-288 02
CZ-342 01	CZ-350 02	CZ-379 01
CZ-391 33	CZ-535 01	CZ-538 43
CZ-561 02	CZ-624 00	CZ-691 30
CZ-741 01	CZ-747 74	CZ-747 81
CZ-763 16	CZ-763 21	CZ-793 91

Denmark

DK-4200	DK-4460	DK-4912
DK-5220	DK-5500	DK-6100
DK-6600	DK-6650	DK-7320
DK-7500	DK-7550	DK-7650
DK-7660	DK-7755	DK-7755
DK-7700	DK-7860	DK-8464
DK-8620	DK-8830	DK-9300
DK-9500	DK-9700	DK-9870

Effective coverage for all fluids

HEXA-COVER®

Michael Aaen Jensen, Grambo Mink, DK-9300

"Like all other elements of our environmental approval, the cover should be approved by the authorities. On that basis, I examined the various options and I decided to go for the Hexa-Cover®.

I contacted the Company, and the Hexa-Cover® was in the tank only a few days later. The installation lasted approx. half an hour, the sacks are hoisted up over the edge and the Hexa-Cover® automatically creates a coherent cover.

I am very satisfied with the Hexa-Cover® solution, it is authorized and approved, it is effective, very easily manageable and long-lasting.

My calculations also show that the Hexa-Cover® is the cheapest solution"

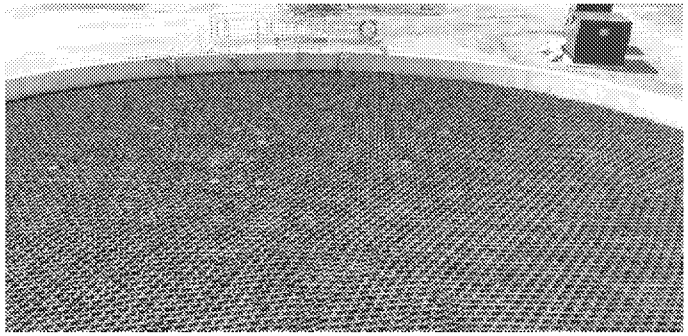
Mr. Joergen Rasmussen, DK-8464

"After trying several other solutions, I installed the Hexa-Cover® for covering my slurry tanks. Hexa-Cover® offer me effective odor elimination as well as elimination of emission, very easy and simple installation, no supervision and maintenance, and not least a much easier access to the slurry, when i.e. mixing and emptying.

Hexa-Cover® is a long lasting and stable solution as the tiles are just being poured onto the slurry where after they automatically organize as a cover. Furthermore a lot of problems, and not the least costs, are now avoided.

Prior to installing the Hexa-Cover® other solutions were considered, including a tank-top. But going through the economics in this solution – both in terms of purchase, insurance, and expected lifetime – the decision were quite easy. Really, the Hexa-Cover® is a lot cheaper!

Also the very difficult access to the slurry when using a tank-top meant that this solution was deselected. The very few, and small openings, in the tarpaulin means difficult access followed by damages, and this really is costly in terms of repairs and maintenance!



So, I am very satisfied with the Hexa-Cover® as it is effective, very easily manageable and long-lasting.

I can highly recommend the Hexa-Cover®"

Mr. Ejvind Sorensen, DK-9500

"Having tried with e.g. cut straw, I decided to end all hassle about covering my slurry tank.

An easier and better solution was needed.

I have now chosen Hexa-Cover® - this solution is brilliant as I both achieve a very efficient removal of both odors and emissions of ammonia.

Further the Hexa-Cover® is very easy and simple to install and operate"

France

F-12580	F-16100	F-16110
F-16140	F-16260	F-18300
F-47400	F-81190	

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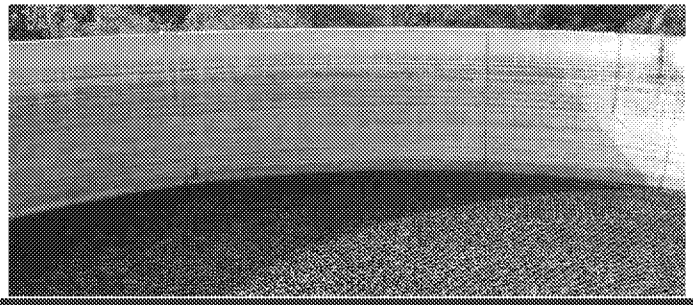
HEXA-COVER®

Germany

D-01900	D-01561	D-02699
D-02899	D-04654	D-04746
D-04774	D-04838	D-04886
D-04936	D-06628	D-06447
D-06773	D-06869	D-06917
D-06918	D-07613	D-07554
D-08569	D-09232	D-09618
D-09634	D-14550	D-14715
D-14913	D-15306	D-15308
D-15806	D-16244	D-16248
D-16368	D-16775	D-16831
D-16928	D-17349	D-17437
D-18233	D-18292	D-21261
D-21354	D-21379	D-21516
D-21539	D-21698	D-21717
D-23812	D-23936	D-23968
D-24407	D-24817	D-24963
D-24986	D-25719	D-25842
D-26219	D-27239	D-27330
D-27383	D-27404	D-28557
D-29303	D-29331	D-29364
D-29365	D-29439	D-29456
D-29493	D-29578	D-29581
D-29614	D-29634	D-29640
D-29643	D-29646	D-29664
D-31515	D-31863	D-32351
D-32683	D-32791	D-33184
D-33034	D-33442	D-36341
D-36179	D-36433	D-37154
D-38170	D-38527	D-38539
D-38835	D-39418	D-39444
D-39448	D-39579	D-39606
D-41751	D-47608	D-47665
D-47906	D-48231	D-48324
D-48346	D-48366	D-48369
D-48465	D-48683	D-48691
D-49143	D-49152	D-49179
D-49326	D-49328	D-49356
D-49400	D-49406	D-49429
D-49453	D-49456	D-49509
D-49624	D-49692	D-49740
D-49828	D-49838	D-52223
D-55568	D-56299	D-57080
D-59069	D-59075	D-59199
D-59227	D-59229	D-59269
D-59320	D-59329	D-59348
D-59494	D-59505	D-59609
D-63584	D-63877	D-70173
D-74639	D-74653	D-78736
D-74838	D-84168	D-84337
D-86444	D-86637	D-86690
D-98634		



Effective coverage for all fluids

Mr. Cornelius Brodersen, D-25842

"I chose Hexa-Cover® for several reasons. It is a simple, effective and recognized solution for minimizing odor.
The emission of ammonia is also drastically reduced and the fertilizer remains in the tank.
The handling of Hexa-Cover® is very simple, they are poured onto the surface and spread itself and Hexa-Cover® automatically creates a floating lid.
There are no problems accessing the liquid from the top of the tank, or to let the "arm" go into the container.
After stirring, the Hexa-Cover® elements distribute themselves again and form the cover. There is no need for further action, or use of any tools, and the tank can be inspected at any time. However, rainwater is to be spread with the slurry"

Mr. Rathmann, D-70173

"We chose to cover our digestate with Hexa-Cover® as this solution meets requirements and is approved by authorities, it is effective and very easy to handle, and it is affordable.

All these advantages have convinced us on Hexa-Cover®"

HEXA-COVER®

Italy

Zip	M2 covered
I-10046	430
I-10060	756
I-10068	314
I-12012	226
I-12020	628
I-12030	900
I-12030	300
I-12030	612
I-12030	710
I-12030	1.200
I-12030	1.200
I-12035	1.034
I-12035	376
I-12035	650
I-12035	1.032
I-12038	250
I-12040	789
I-12040	200
I-12040	460
I-12040	700
I-12040	410
I-12041	255
I-12041	760
I-12041	2.000
I-12042	1.200
I-12042	85
I-12044	2.400
I-12044	612
I-12045	1.008
I-12045	152
I-12045	133
I-12045	314
I-12076	1.196
I-12080	1.040
I-12080	1.040
I-12100	426
I-19126	160
I-20014	1.550
I-20014	360
I-20014	1.193
I-24051	900
I-25030	240
I-26027	1.100
I-26817	800
I-26865	860
I-27010	840
I-27010	840
I-27010	16
I-27010	800
I-27011	1.200
I-27011	160
I-27014	1.200
I-27016	400
I-27018	360
I-27018	1.200
I-28010	640
I-31027	904
I-33085	610
I-37056	1.200
I-37056	800
I-37060	1.200
I-37060	1.200
I-37060	360
I-37060	240
I-37060	520
I-37060	1.200
I-37060	1.200
I-37060	1.200
I-37060	1.200
I-37060	1.200
I-37060	1.200
I-37067	3.600
I-37017	314
I-41037	840
I-45011	668
I-45011	80
I-46100	40
Total, Italy	Approx. 60.000 m2

Effective coverage for all fluids

HEXA-COVER®

Hungary
HU-4341 (3.000 m² slurry tank)
HU-9970

Japan
JP-216 0033

Latvia
LV-3301

Lithuania
LT-01109
LT-33352 (2.200 m² slurry tanks)

Netherlands
NL-6732

Norway
N-7670

Poland
PL-32 095

Portugal
PT-4700

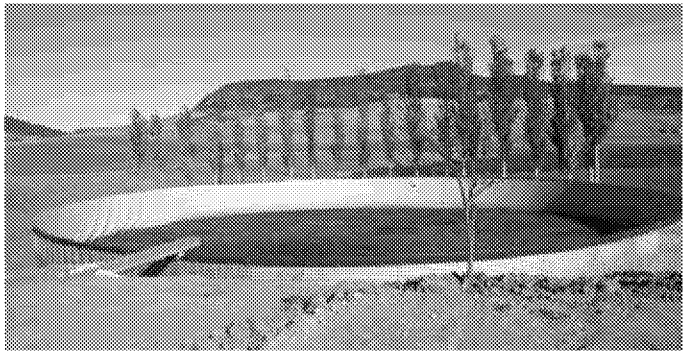
Scotland
AB51

Serbia
1.040 m² slurry tank

Spain
E-04716
E-17745
E-31219
E-50637

Granja Joar, E-31219 Navarra

"We are indeed very satisfied - the odor is gone. Hexa-Cover® distributes themself on the surface and creates a full cover"



Sweden

S-100 12	S-245 34	S-311 96
S-312 98	S-447 93	S-520 43
S-524 95	S-534 92	S-542 92
S-566 92	S-582 23	S-585 92
S-590 76	S-660 50	S-733 22
S-740 81	S-761 75	

Effective coverage for all fluids

Eriksson, Reimert, S- 445 34:

"I looked for an effective solution that could meet my requirements in terms of both efficiency and economy as the solution also had to be approved by the authorities, easy to handle and require minimal maintenance.

All these requirements were met with the Hexa-Cover®, which I can only give my very best recommendations"

Wiberg, Anders, S-531 97:

"*We have now had our Hexa-Cover® for some years - it works extremely well*"

Mr. Göran Andersson, S-585 92

Göran Andersson, Linköping - local contact into LRF - "Lantbrukarnas Riksförbund" (Sweden Farmer Association) chose Hexa-Cover®.

Based on his many years of experience Mr. Göran Andersson decided to install Hexa-Cover® in his manure tank. Mr. Göran Andersson explains about the choice of Hexa-Cover®:

"*We have only positive experiences.*

The Hexa-Cover® has worked very well. The solution is effective, very simple and easy to manage and needs no maintenance, repair or the like.

I recommend Hexa-Cover®"

HEXA-COVER®

Switzerland

CH-1377 CH-2072 CH-5244
CH-6038 CH-6277 CH-8194
CH-8918 CH-9504

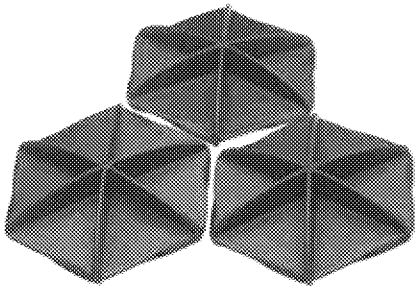
Mr. Thomas Battiston, CH-8918

"I chose Hexa-Cover® as it is very effective in reducing odors and emissions of ammonia.

Further it is a very easy and simple solution. The Hexa-Cover® is added into the tank and that's it!

The tiles distribute themselves automatically, and create the desired coherent cover.

The very long lifetime of Hexa-Cover® is also an important factor, and especially in view of this, the Hexa-Cover® is very competitive pricewise"



Mr. Wüest, CH 5244

"I installed Hexa-Cover® Floating Cover on my pit - the discs spreads like the video shows.

With Hexa-Cover® we have basically no odor as the surface is completely covered.

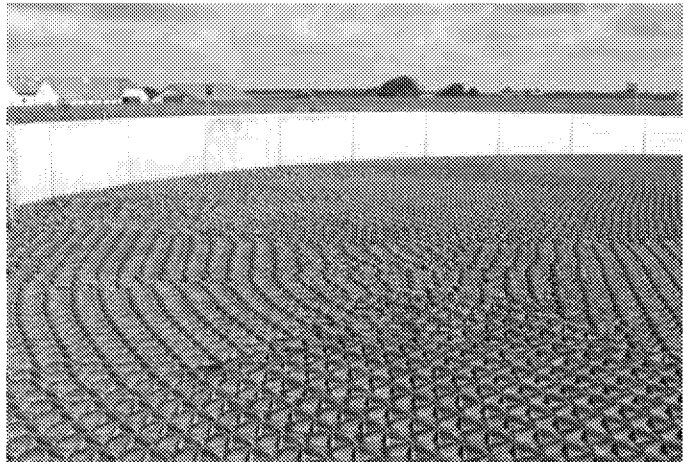
It also means a lot to me that I know the cover is always intact. In addition, I am of course happy that the emission of ammonia is minimal.

The Hexa-Cover® floating cover meets my requirements, it is effective, does not require maintenance and last much longer than other solutions.

Apart from these considerations, I believe the Hexa-Cover® container cover also has a very economically attractive solution"

UK

B50 (1.800 m^2 slurry tank)
BD12
DL13 (2.700 m2 slurry lagoon)
DN20
DN22
EH27
IP6
TF10
YO23
YO25 (1.465 m^2 slurry tank)
YO42
YO61



HEXA-COVER®

USA

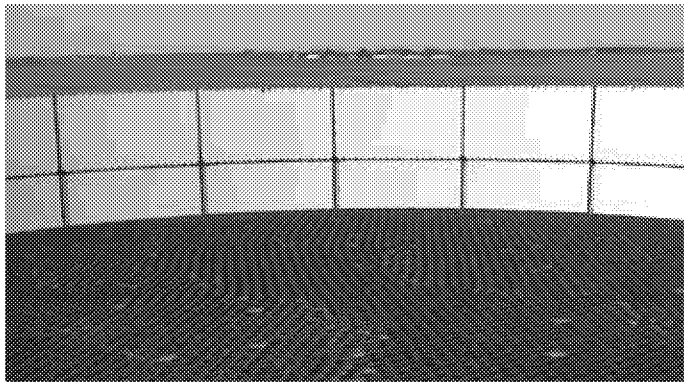
David Erickson, Triple E Farms, IL

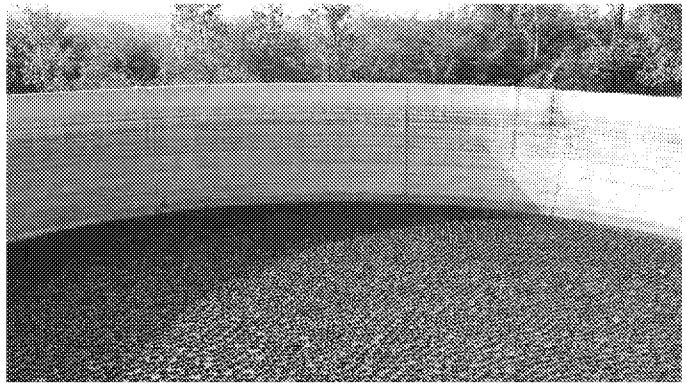
"I installed the Hexa-Cover® on my new 67' diameter Slurrystore in June 2009. It spread out just like the company video shows!

I have another Slurrystore that I try to maintain a straw bio-cover on. The Hexa-Cover® structure has less odor because its surface is almost completely covered while some of the straw has sunk or moved in my other structure. The straw also adds to the solids in the structure.

The Hexa-Cover® looks like they will last a long time. I believe that over time, the Hexa-Cover® will be more economical and more effective than a bio-cover.

Unlike a bio-cover or fabric cover, the Hexa-Cover® should also be maintenance free for many years"





Bob Heers, Heers Family Farm, Owatonna

"We have found the Hexa-Cover® to be a simple and effective solution for covering our manure pit. The individual tiles disperse across the entire surface and align themselves to form a free floating cover that requires no maintenance or upkeep.

Our experience leads us to believe that this cover is virtually indestructible and will have a extremely long lifespan"

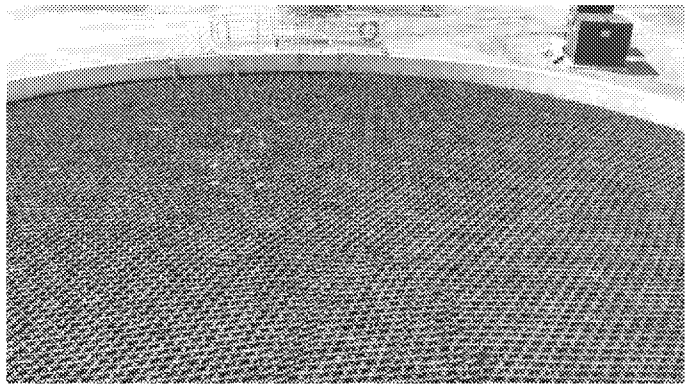
Hexa-Cover® is manufactured in North America, Australia and the EU

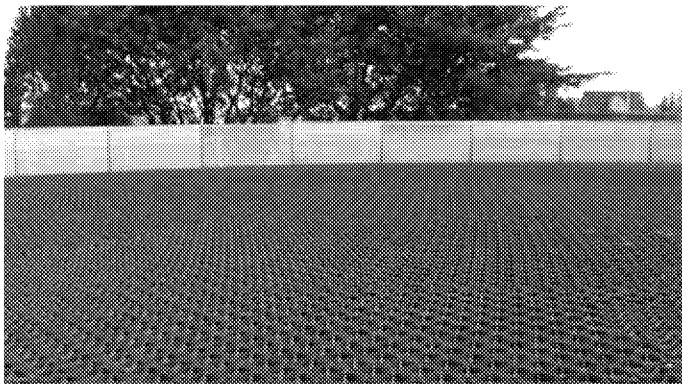
Hexa-Cover® Floating Cover qualifies for EQIP-funding in USA

Hexa-Cover® is Tested by DLG Testzentrum, Germany

HEXA-COVER®








For more information

Hexa-Cover A/S • Vilhelmsborgvej 5 • DK-7700 Thisted, Denmark • TEL +45 96 17 78 00
www.hexa-cover.com • info@hexa-cover.dk

Effective coverage for all fluids

QUOTE / ESTIMATE

SHIP TO
Fairborn, Ohio, 45324 Attn: James Arambarri

BUYER
Azura Associates 226-203-3915

AWTT INC.
ADVANCED WATER TREATMENT TECHNOLOGIES
Engineered for a lifetime...

http://www.awtti.com
Questions? 541-716-5255

Ship VIA	F.O.B.	SHIPPING TERMS
Freight	Trenton, S.C. 29847	25% down, x% before shipping

ITEM #	DESCRIPTION	QTY	UNIT PRICE	TOTAL($)
HT-AQ-CUS	Hexprotect AQUA Cover® ***(custom water ballasted) - 130 mph wind resistant - 490 gr.***	38000	[redacted]	[redacted]
SC	Surcharge - *resin shortage*	38000	[redacted]	[redacted]
SHP	Shipping (estimate)	1	[redacted]	[redacted]
Notes:	25% down, x% before shipping			
			SUBTOTAL	[redacted]
			TAX RATE	$0.00
			TAX	$0.00
			S&H (Freight)	$0.00
			OTHER	$0.00
			ESTIMATE TOTAL USD	[redacted]

Incremental payments with each load; All quotations and sales of Products are exclusively and expressly made on AWTT Terms and Conditions unless otherwise agreed to in writing by Seller.

Please, review terms and conditions of sales (www.awtti.com); Acceptance of this Estimate and Purchase order issuance deems AWTT terms and conditions have been accepted

Any refusals of deliveries, re-consignments, or delays are the full responsibility of the consignee.

International orders: Taxes, fees and duties not included; Shipping are estimates only; Price of cover does not include shipping unless specified otherwise

Quote Valid for 60 Days

iec

The Innovator of Insulated Covers

IEC2022-budgetary r0

MODULAR COVER
PROPOSAL / PURCHASE AGREEMENT FOR
Fairborn, OH

May 25, 2022

Prepared For

James Arambarri

iec
The Innovator of Insulated Covers

Proposal Contents

I. Introduction

II. Industrial & Environmental Concepts Design

III. Scope of Supply: Materials, Services, Installation Conditions and Project Notes

IV. Project Pricing

Introduction to Industrial & Environmental Concepts

Industrial & Environmental Concepts (IEC) is the #1 insulated modular cover manufacturer in the United States. IEC has extensive experience in custom designing and fabricating insulated covers. IEC has over 950 insulated covers worldwide. Our innovative cover designs have been installed throughout North America and across five continents. IEC engineers design each insulated cover to meet client specifications and operational requirements. IEC implements continuous quality checks and testing to insure our cover meets the Geomembrane Research Institute standards on materials and workmanship. Our unique design offers numerous advantages over other cover types. IEC's insulated covers retain water temperature, improving nitrification and overall WWTF performance.

IEC Excellence, Awards, Patented Systems and Experience

- 2014 Innovative Award from Water Environment Federation
- 2015 Governor's Award for Minnesota
- 2017 IAFI International Award for Outstanding Achievement in Mines, Landfills and Wastewater
- 2017 IAFI International Award for Excellence in Technical Design
- 2018 MN Family Business Award
- IEC has over 1,400 covers and liners installed in 49 states and 17 countries
- Installations in 49 states and 17 countries;
- EPA's 10-year publication on Design Guidelines for Ponds had a dedicated section on IEC's floating cover design included in their publication

Cover Details & Benefits

WWTF's have difficulty meeting ammonia limits due to cold water temperatures. IEC insulated covers retain heat, which is essential for autotrophic bacteria to nitrify. The cover occupies the entire air to water interface, retaining water temperature.
IEC covers do not require daily O&M, enabling operators to concentrate on other aspects of their job. IEC can provide insulated, closeable hatches or openings to enable operator access anywhere on the pond if there is a need for sampling or accessing equipment. We can provide textured surfaces to those locations.

In addition to retaining temperature, the cover prevents algae and controls odor. If installed over an area without aeration and mixing, a quiescent zone is created which promotes settling of solids, including those organic solids that were produced upstream.

The cover does not require gas collection or any rainwater pumping system. It can be designed to adjust to water level variations without problem. This cover has been successfully used by hundreds of clients including municipal & industrial wastewater treatment plants, food & beverage manufacturers, wineries, chemical factories, industrial manufacturers, etc.

INCLUDES (Provided by IEC)

1. All items supplied per IEC's standard parts and design. **Furnishing geomembrane (40-mil HDPE), 13-R proprietary flexible foam, fasteners, stainless steel mooring cabling, mooring plates, stainless steel cable clamps necessary to secure cover, and perimeter sandtubes with fasteners/straps.**
2. Shipment of fabricated cover system(s) to INSTALL SITE.(FOB Lakeville, MN), customer must receive shipments continuously once manufacturing is started.
3. **Option for one (1) mobilization / demobilization** is included in base bid. IEC must be notified in writing that the basin is ready for cover installation. IEC will be compensated for any additional mobilization.
4. **Option for Superintendent** for cover installation with unrestricted work hours for 7 days per week. IEC charges $875.00/man-days for stand-by days (ie delays not caused by IEC and not weather related).
5. **All pay at non-union/non-prevailing rates**. If other wage rates are required, owner/prime contractor to compensate IEC for all additional costs.
6. Fabrication of cover system(s)
7. Equipment necessary to fabricate cover system(s)
8. Terms: **Thirty-five percent (35%)** at time of contract or purchase order release. Balance of material invoices are **net thirty (30) days** from shipment date. Balance of installation labor invoices are **net thirty (30) days** from invoice date. Invoices not paid within **thirty (30) days** from the date of issue will be subject to a finance charge of **1.5 % per month, 18 % per accrue** or the highest rate allowed by law on the unpaid balance. All Retainage or hold backs amounts are due **forty-five (45) days** from date of substantial completion of IEC's scope of supply.
9. The terms & conditions of IEC's **one (1) year** Limited Workmanship Warranty and the material manufacture's **five (5) year** Material Warranty shall apply.
10. No sales tax on the finished product is due the state of Minnesota when the product is sold outside the state. If taxes are due in the state of installation, they are the full responsibility of the owner.
11. **Due to resent volatile fuel costs, shipping costs changes may be adjusted at the time of loading trucks / containers.**

EXCLUDES (Provided by Owner or Prime Contractor)

1. Any permits required by local, state, EPA or federal authorities. Any bonding of project.
2. Any sales tax due state of installation; sales tax will be imposed unless Tax Exemption Form provided.
3. Offloading of materials delivered prior to IEC arrival & loading of excess materials after IEC has left site.
4. If needed for installation: crane, spreader bar & operator
5. Any piping, concrete or earthwork. Site survey or field measurements.
6. During installation, any solids, grease, or other items on water surface must be removed.
7. Any effect on cover(s) from wind, mixing and/or sludge movement under cover(s)
8. Safety harnesses and life-lines will not be used during install; they are dangerous to workers
9. **Foreman & seven(7) general laborers** for cover installation (estimated at **7 Working-days**)
10. If IEC is providing a Superintendent for the installation, **at least ninety(90) days prior**, email to IEC construction schedule with projected start date of geomembrane installation.
11. If IEC is providing a Superintendent for the installation, **at least fourteen (14) days prior**, email to IEC actual start date of geomembrane installation; including written confirmation that basin, perimeter, water-level and entire site is ready for geomembrane installation to begin, with no outstanding operations that could impede geomembrane work.
12. If IEC is providing a Supervisor for cover installation(Optional) guidance:

    Pricing is based on working in a non-hazardous areas

    Owner suppling power source(likely a generator) & extension cords for welding equipment. Consumption: of (1800 Watts, 15 amps @ 120 Volts) & (3552 Watts, 14.8 Amps @ 240VAC, single phase)

    One (1) mobilization/demobilization is included in IEC supervisor option, IEC will be compensated for any additional mobilizations.

COVER:	Diameter	220.0 -ft =	**38,013**	square feet
		Total =	**38,013**	square feet

PROPOSAL PRICING

		Initial Total	Initial for
Modular Cover(s). All items supplied per IEC's standard parts and design.	=	$ [redacted]	
Optional: Superintendent for 7 days on site.	=	$ [redacted]	

Proposal is valid for **14 days** from date of proposal due to recent material cost changes

BY **Michael Lever** Date: **2022-05-25**

Proposal # IEC2022-budgetary r0 **Fairborn, OH**

Any further questions can be addressed by IEC at (952) 829-0731.

SIGNATURE LINE

THIS AGREEMENT IS SUBJECT TO THE TERMS AND CONDITIONS SOLEY EXPRESSED ABOVE WITHIN THIS PROPOSAL / PURCHASE AGREEMENT:

To confirm this order please return a signed copy of this Purchase Agreement with authorized signature to your IEC Sales Manager, **Mike Lever** at: **mlever@ieccovers.com**

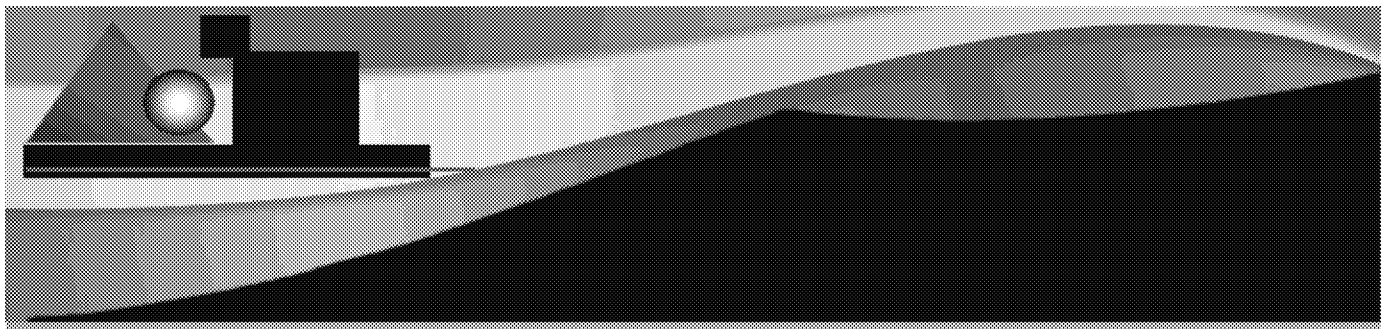
Company:

Signature:

Name:

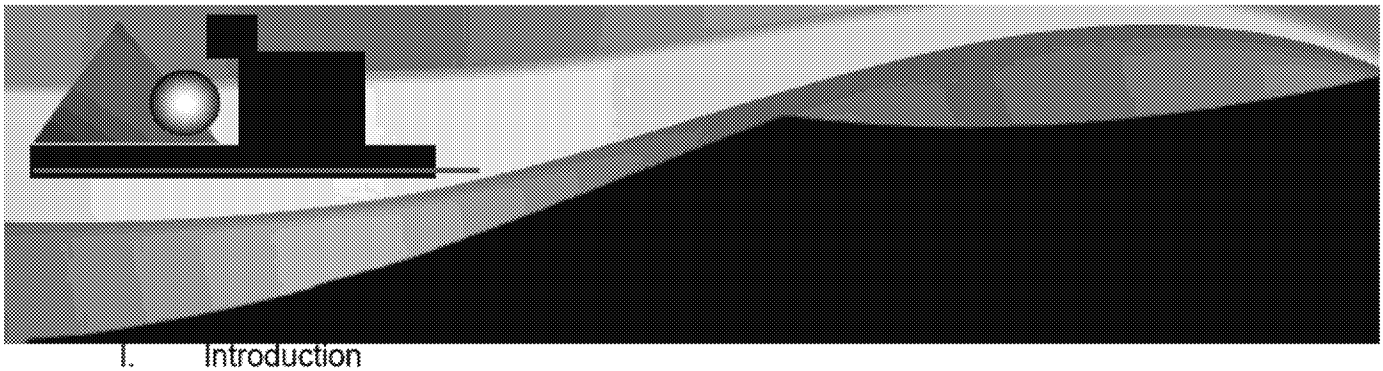
Title: Date: / /

Please initial above items being ordered . **Total Purchase Value =**	**$**



LINER AND GAS COLLECTION FLOATING COVER
BUDGETARY PROPOSAL
Ohio Dairy

June 21, 2022



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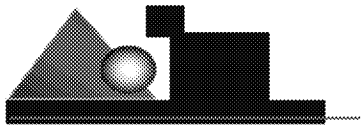

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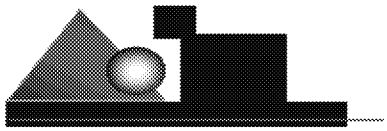
- EPA's 10-year publication on Design Guidelines for Ponds had a dedicated section on IEC's floating cover design included in their publication

Cover Details & Benefits

IEC's Floating Gas-Collection Covers are comprised of a continuous impermeable geomembrane designed to capture biogas generated within the liquid contents on which they float. They are designed to be operated under a continuous slight vacuum (usually less than -0.5inH2O) to remove the biogas as it is collected.

Each cover includes a ballast weight system. The ballast weight system serves to further protect the cover against wind uplift and creates a low spot on the cover for rainwater and snowmelt to be collected and directed to rainwater sumps (sump pumps not included) to remove water from the surface.

The cover system will be secured at the top of the berm in an anchor trench, or with batten bar if required. The trench will be backfilled with the trench spoils and compacted to a point that geomembrane cannot pull out of the anchor trench. A perforated perimeter biogas collection header pipe will be installed at the top of the berm under the cover to create a permanent head space for biogas transfer to a draw-off point. The floating gas-collection covers by IEC will be designed to accommodate a specified fluctuation in liquid level.



INCLUDES (Provided by IEC)

1 Supply & install for Liner: 60-mil HDPE geomembrane, two 12" pipe boots. Leak Location Survey

2 Supply & install for Cover: 80-mil PE floating cover geomembrane, Lateral Floats, cover ballast weight, ballast weight straps, fasteners, perforated perimeter bio-gas collection piping, perimeter pipe straps, 2 sample ports & 1 hatch openings, One 4-inch gas discharge port with flange & backer-ring (for connection to biogas discharge pipe/flange by others) and 1 sump bucket.

3 Shipment of materials to project site. Customer must receive shipments continuously once project is started.

4 Superintendent & field technicians for cover installation with unrestricted work hours for 7 days per week. IEC charges $875.00/man-days for stand-by days (ie delays not caused by IEC and not weather related)

5 All pay at non-union/non-prevailing rates. If other wage rates are required, owner/prime contractor to compensate IEC for all additional costs.

6 One mobilization / demobilization is included in base bid. IEC must be notified in writing that the basin is ready for cover installation. IEC will be compensated for any additional mobilization.

7 Fabrication of cover system and welding equipment necessary to fabricate cover system(s).

8 Extra roll goods at the comple ion of the project will remain the property of IEC & will be shipped offsite by IEC.

9 Terms: Thirty-five percent (35%) at time of contract or purchase order release. Balance of material invoices are net thirty(30) days from shipment date. Balance of installation labor invoices are net thirty(30) days from invoice date. Invoices not paid within thirty(30) days from the date of issue will be subject to finance charges of 1.5 % per month, 18 % per accrue or the highest rate allowed by law on the unpaid balance. All Retainage or hold backs amounts are due forty-five(45) days from date of substantial completion of IEC's scope of supply.

10 All destructive test samples will be cut from geomembrane outside/bottom of the perimeter anchortrench or outside the ringwall. All IEC gas/water-tight seams will be visually inspected, non-destructively, and destructively tested. IEC has no responsibility to provide leak location surveys or independent laboratory testing. The geosynthetic materials will be tested by the manufacturer during the manufacturing process, by the material manufacture's laboratory. Copies of the test results and certifications can be supplied to the General Contractor/Owner.

11 The standard terms & conditions of IEC's one year Workmanship Warranty and manufacturer five year Material Warranty shall apply. IEC's warranty will be made part of any contract and/or purchase order involving IEC. The terms included in IEC's warranty will govern any and all disputes between IEC's warranty and any other warranty requirement.

12 Any Liquidated Damages are outside IEC's scope and are excluded

13 No tax (use or sales) on the finished product is due the state of Minnesota when the product is sold outside he state. If taxes are due in he state of installation, they are the full responsibility of the owner.

14 Payment and/or Performance Bonds are not included in IEC pricing/proposal.

15 Due to resent volatile fuel costs, shipping costs changes may be adjusted at the time of loading trucks /containers.

EXCLUDES (Provided by Owner or Prime Contractor)

1 Any permits required by local, state, EPA or federal authorities.

2 Any taxes due state of installation; taxes will be imposed unless Tax Exemption Form provided.

3 Prime Contractor or Owner's representative must provide written approval of all material spec sheets contained in submittals prior to manufacturing of materials for project. (Note: Geomembrane manufacturer will not ship materials without written approval). "Review only" of submittals wi hout written acceptance is not acceptable.

4 At least ninety(90) days prior, email to IEC construction schedule wi h projected start date of geomembrane installation.

5 At least fourteen(14) days prior, email to IEC actual start date of geomembrane installation; including written confirmation that basin, perimeter, water-level and entire site is ready for geomembrane installation to begin, with no outstanding operations that could impede geomembrane work.

6 If a liner & cover are being installed, a Leak Location Survey(LLS) must be preformed on the last day of the liner installation.

7 Offloading of cover materials delivered prior to IEC arrival & loading of excess materials after IEC has left job site.

8 Empty install: No structures or elevated piping can be placed on basin slopes or floor. Detail drawings of any such item need to be given to IEC to determine any effect on cover and /or liner.

9 Prepare all surfaces for geosynthetic installation, maintain all surfaces dry, free of sharp objects of any kind on he surfaces for geosynthetic placement. In addition, owner shall remove and continue to remove all water from the geosynthetic & unlined surface work areas for the full duration of the installa ion work. Water pumping must start when water begins to pool, not after rain stops. The surface must be proof rolled with a smooth drum roller. Repairing any forklift ruts & slope damage that develops during install and any reseeding.

10 Prior to the deployment of any geosynthetic materials, the subgrade surface will be inspected by IEC and Owner representative. The surface must be dry, smooth and unyielding, and must be free of all rocks, s icks, roots, vegeta ion and abrupt grade changes or any other condition which may damage the geosynthetic. In addition, the area must be dry and clean. Oily or sticky residues on the surface of earthen or concrete structures must be removed.

11 Provide 8,000-lb. all terrain extended boom forklift & tracked skid loader for he duration of IEC installation work.

12 Dewatering (pumping) of rainwater off of basin, cover, anchortrench, and subgrade prepara ion. All surfaces to be covered shall be free of sharp objects of any kind, clean and dry for the full duration of the project.

13 Sump pump(s), electrical wiring, & discharge hosing. Connection of sump pump electrical wiring to power source.

14 Any effect on cover from wind, mixing and/or sludge movement under cover.

15 Any and all QA/QC tests by third party or independent laboratory.

16 Any piping, concrete, steel, electrical or earthwork.

17 Excavate, maintain, dewater, backfill and compact all Anchortrench. Anchortrench to be compacted to a point that geomembrane cannot pull out of the Anchortrench.

19 Any bonding of project.

20 Storage area for materials within 100 feet of basin, area cannot have standing water.

21 Dumpster for waste (mainly plastic) within 100 feet of basin.

22 Sanitary facilities within 300 feet of basin.
23 Sand pile of 35,125 -lbs.; IEC staff will fill sandbags at site
24 Biogas piping outside of cover, blower, meter and flare.
25 Site survey or field measurements, as-built of site must be provided before fabrica ion of cover(s).

CONDITIONS FOR INSTALLATION (Provided by Owner or Prime Contractor)

1 Proposal based on working in non-hazardous areas, dry conditions, and temperatures above 45 F & below 102 F
2 For installation, water level must be empty, dry and clean. No structures, piping or other items can be placed on basin slopes or floor. Details drawings of any such item to be given to IEC to determine any effect on cover and /or liner.
3 Areas to be covered or lined must be able to support all terrain forklift with roll of geomembrane.
4 Must have continuous forklift access around top of basin perimeter.
5 Owner must provide security at site for all materials and equipment thru duration of time while IEC materials and equipment are on site.

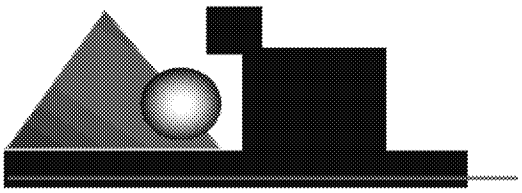
NOTES FOR PROJECT

1 Cover design water level fluctuation of full to empty.
2 Cover designed not to be inflated
3 Safety harnesses and life-lines will not be used during install; they are dangerous to workers
4 Warranty coverage is not in effect if he gas draw off system is not functioning.

-This proposal will become a part of any contract resulting from this proposal. The terms, and Includes and Excludes in this proposal will govern any and all disputes between this proposal and any contract and / or purchase order.
-Any material price increase from IEC supplies due to industry wide changes in costs will be passed on the general contractor or customer.
-Charge for IEC staff to handle pumping of water at site = $ 74.00 at site.
-Payments: Material to be invoiced upon delivery to the job site with progressive billing being made for work completed. For unit price bids, payment to be made for the actual amount of materials installed including materials in the anchor trenches, scrap and overlap.

Project timeline based on geosynthetic work being conducted during a specific number of "Good Weather Days".
A Good Weather Day must comply with the following three conditions (A, B, and C), Days or partial days (minimum 5 Hours) meeting these criteria will be considered Good Weather Working Days (GWWD). -A: Temperature: Between the hours of 9:00 AM and 4:00 PM ambient temperatures will be between 40 and 105 Degrees Fahrenheit. a. Note that during days of intense sun, welding operations will cease if the sheet temperature goes above 160 Degrees Fahrenheit. -B: Precipitation: When relative humidity is more than 80%, during a precipitation event (rain, sleet, snow, etc.), there is dew on the material, or when there is a risk of frost on the ground or on the geosynthetic, EC will terminate all seaming operations. a. It should be noted that rain events that cause flooding or very muddy soil conditions after it stops raining, will prevent IEC from deploying material. Days with these lingering unfavorable site conditions will not be considered GWWD.

i. Example: The site has a rain event that completely saturates the soil around the lagoon to a point where the forklift carrying a roll of material is unable to reach the perimeter of the lagoon to deploy the HDPE. At this point IEC will have to terminate deployment operations until the site conditions are drier. -C: Wind: EC's "senior installation superintendent" will make any and all decisions regarding the continuation or termination of geosynthetic installation, as they apply to wind. Any full or partial days lost due to wind shut down will not be considered Good Weather Days..
-Winter Work Rate: If customer requires production to continue during the colder months; roughly November 15th thru March 15 of the following year, then Winter Work rates will apply. Winter work rates will apply when ambient temps are between 30 and 40 degrees Fahrenheit. For Winter Work IEC will be compensated for additional site-days and Stand-By days as required to complete work due to slower production rates, shorter day-light hours, and poor site conditions. Weather conditions that fall below 30 degrees Fahrenheit will terminate all production. t should be noted that during all cold weather work (below 40 degrees), welding procedures will follow GRI-GM9 parameters.



Basin Size:	335.0 -ft. x	335.0 -ft. =	112,225	square feet
		Total =	**112,225**	square feet

PROPOSAL PRICING		Initial Total	Initial for purchase
80-mil HDPE Gas Collection Cover	=	$ [redacted]	
60-mil HDPE Liner	=	$ [redacted]	

BY Dave Anderson Date: 6/21/22
TITLE Tech. Sales
PROPOSAL # 06/21/22 Ohio Dairy

Any further questions can be addressed by IEC at (952) 240-3321

SIGNATURE LINE

THIS AGREEMENT IS SUBJECT TO THE TERMS AND CONDITIONS SOLEY EXPRESSED ABOVE WITHIN THIS PROPOSAL / PURCHASE AGREEMENT:

To confirm this order please return a signed copy of this Purchase Agreement with authorized signature to Industrial & Environmental Concepts, Inc at: anderson@ieccovers.com

Please initial above items being ordered . **Total Purchase Value =**	**$**

RE: Digestate tank cover

RM Ron MacKenzie <ronm@inlandtarp.com>
To: James [illegible]

Reply | Reply All | Forward | ...

Tue 2022-06-14 1:13 PM

220' DIA - FLOATING COVER_SHEET 1 OF 2.pdf 325 KB
220' DIA - FLOATING COVER_SHEET 2 OF 2.pdf [illegible] KB
FLOATING COVER DETAIL.pdf [illegible] KB
126' - FLOATING COVER DETAIL.pdf 427 KB
IT-20 CWPE Tech Sheet.pdf [illegible] KB
Spec RPP Both_36.pdf [illegible] KB

James,

Attached is an example of the floating bubble style cover.
It is made with a layer of 20 mil CWPE (white up) on top and Black 20 mil bubble wrap underneath. We place grommets in the cover every 10 feet as a point of drainage for any surface water. Due to its size it needs to be in 4 pieces and gets zip tied together in situ.
While it would provide some odor mitigation not sure how much or how to quantify.
Ball park costing on this cover is [redacted] delivered to site. Install by others. Life expectancy 3-5 years

The Floating cover drawings depicts the way we would do a 1 piece sealed cover and allow for collection of rainwater.
This is what we refer to as a tensioned cover. As the cover floats up, sand tubes on the perimeter create the drainage trough and keep the cover in place. A pump is in the trough to draw off water, typically under manual operation on inspection weekly. This cover is made with RPP 36 mil and would have a life expectancy of around 15-20 years.

Costing on this option would be around [redacted] and requires a liner installer to weld the sections in place. We would also probably need to include some venting as well to mitigate any gas uplift issues.

Once you have had some time to absorb feel free to give me a shout.

Best regards,

Ron

Ron MacKenzie
Chief Technical Officer
<image001.jpg>
www.inlandtarp.com

Evans, Barry

From: Jim Martin <JMartin@lemna.com>
Sent: Tuesday, June 21, 2022 11:45 AM
To: Evans, Barry
Cc: Mark Rasor; Erin Painter
Subject: FW: Cover Opportunity

Importance: High

Good morning Barry,

I tried reaching you on the number below, but there was no answer or message service. I am assuming you are not looking for full gas containment and collection of the odorous gases, just a cover option to minimize and reduce odors coming from the tank and earthen basin. We have two alternative technologies that have been used quite successfully for odor minimization for this type of application, specifically for manure and other high strength wastes such as rendering plant waste, food processing etc.

The first product is the LemTec Insulated Modular Floating Cover. This technology has been around since the mid 1990's and has a long history of odor control applications as well as heat retention and other process related benefits. Here is a direct link to that product on our website: https://www.lemnatechnologies.com/modular-insulated-cover-system. This technology is considered a custom, engineered product, specific to the size and configuration of the tank we are covering. The product has a variety of design features and capabilities. The product can even be walked on for maintenance and servicing needs. A rough ballpark cost is Not Responsive This technology will provide the highest degree of odor minimization, short of providing complete gas capture.

The other alternative technology would be our segmented cover products, such as the Hexacover product. The product is simply dumped into the tank or basin and will self-distribute. See attached link here: https://www.lemnatechnologies.com/segmented-floating-cover This product does not provide the level of odor minimization as the modular cover but is effective. Although it is easier to install, removal, if often or routinely needed, is a little more challenging. Typical rough cost for this type of product would be in the Not Responsive Not ResponsiveNot Responsive

Please feel free to contact me at the numbers below to discuss in further detail.

Thank you,

Regards,
Jim Martin
President and CEO
L E T
LEMNA ENVIRONMENTAL TECHNOLOGIES, INC.
DIRECT: (612) 253-1970 | CELL: (612) 802-0454
TREATING YOUR WATER RIGHT

From: Erin Painter <EPainter@lemna.com>
Sent: Tuesday, June 21, 2022 9:58 AM
To: Jim Martin <JMartin@lemna.com>; Mark Rasor <MRasor@lemna.com>
Cc: Magda Styczen <MStyczen@lemna.com>
Subject: Cover Opportunity
Importance: High

Jim or Mark,

Do one of you have some availability today to talk with Barry (information below)? He has an immediate need for some estimated cover costs that he needs today.

Barry Evans
519-404-5913

Consulting Engineer in Canada
Client in OH w/ Odor Issues
Cover for Circular Concrete Tank – liquid manure tank 220 ft diameter
Level fluctuates from 3 ft to 19 ft

In ground lagoon – 335 ft x 335 ft x 12.5 ft depth
3ft – 10 ft operating range
This is potential to replace the tank

Ballpark costs by 6/22 AM

Prefers phone call

Regards,

Erin Painter
Director of Operations
L E T
LEMNA ENVIRONMENTAL TECHNOLOGIES, INC.
4215 White Bear Parkway, Suite 200
Vadnais Heights, MN 55110
MAIN: (612) 253-2000 **EXT.** 1102
DIRECT: (612) 253-1940
EMAIL: epainter@lemna.com
WEBSITE: www.lemnatechnologies.com

TREATING YOUR WATER RIGHT

Appendix B

Option 3 Supporting Information:

New Digestate Lagoon with Emission Elimination

Evans, Barry

From: Evans, Darin R <darin.evans@evoqua.com>
Sent: Tuesday, June 21, 2022 10:52 PM
To: Evans, Barry
Cc: MacLean, Vanessa K
Subject: RE: Evoqua Inquiry: Engineering

Hello Barry,

Covers for the tank and lagoon would be in the [redacted] depending on design.

Regards,
Darin

Darin Evans
Geomembrane Technologies™

Evoqua Water Technologies Canada Ltd
Tel: +1 (506) 451 7204
Mobile: +1 (506) 449 1377
darin.evans@evoqua.com

From: MacLean, Vanessa K <vanessa.maclean@evoqua.com>
Sent: Tuesday, June 21, 2022 9:51 AM
To: Evans, Darin R <darin.evans@evoqua.com>; Weese, Cody D <cody.weese@evoqua.com>
Subject: FW: Evoqua Inquiry: Engineering

looking for a proposal for a confidential customer in Ohio. Information that they could provide is below.

Regards,

Vanessa MacLean, BBA
Business Development Specialist I Proposal Coordinator– ADI Systems & Geomembrane Technologies
Evoqua Water Technologies Canada Ltd.
370 Wilsey Road
Fredericton, New Brunswick E3B 6E9
Tel: +1 (506) 451-2259
Mobile: +1 (506) 429-7370 (Direct)
Fax : +1 (506) 452-6625
vanessa.maclean@evoqua.com

Evans, Barry

From: Robert Emmons <Robert.Emmons@layfieldgroup.com>
Sent: Tuesday, June 21, 2022 9:39 AM
To: Evans, Barry
Subject: Re: Floating Membrane Covers

The two costs, are installed. On the second we don't know design requirements of the containment liner so this portion could be [redacted] These numbers don't include any earthworks or concrete work . There are a number of potential components we might use including geotextile, geocomposite, Geoysnthetics clay liner, multiple layers Geomembrane. Thickness 40 to 100 mill.

Digester work I'm not sure what AWWA has to offer but the AWWA Cal Nevada specs are helpful for potable water especially not so sure about waste lagoons.
If we had a signed contract we need around 8-10 weeks to mobilize and the project will require at least a month of decent weather; this area would want to be done by mid October and probably couldn't start until late May. If you are bidding design build probably add another 5 weeks for design and submittals approval. Engineering costs as required may be additional.

Hope this helps.
Thanks
Robert D Emmons
Business Development Manager
Layfield USA, Corp.
+011/425-503-6979

> **From:** Robert Emmons <Robert.Emmons@layfieldgroup.com>
> **Sent:** Monday, June 20, 2022 6:26 PM
> **To:** Evans, Barry
> **Subject:** RE: Floating Membrane Covers
>
>
>
> Hi Barry,
>
> I turned this into our estimating and we're getting it scheduled to do a budget estimate but it's a pretty significant exercise to budget and I'll need about 2 weeks to allow our Estimators time to review and formulate. The tank cover is probably in the neighborhood of [redacted] and the other cover [redacted] but beyond that we'll need our estimating to dive into to provide a structured response.
>
> Did you still want I work on this?

Robert D. Emmons I Business Development Manager | Layfield USA, Corporation
18417 – 72nd Ave S Kent, WA 98032
phone: 425-254-1075 | mobile: 425-503-6979 | robert.emmons@layfieldgroup.com

Evans, Barry

From: Darrin Hopper <Darrin@h2flow.com>
Sent: Monday, June 20, 2022 12:51 PM
To: Evans, Barry
Subject: Re: Large diameter tank covers and storage tanks

20 weeks delivery

Ballpark 45 days per tank erection.

Get Outlook for Android

From: Evans, Barry
Sent: Monday, June 20, 2022, 12:46 p.m.
To: Darrin Hopper <Darrin@h2flow.com>
Subject: RE: Large diameter tank covers and storage tanks

Great.

Any idea on delivery and installation time?

From: Darrin Hopper <Darrin@h2flow.com>
Sent: Monday, June 20, 2022 12:44 PM
To: Evans, Barry
Subject: Re: Large diameter tank covers and storage tanks

Yes, this is correct.

Get Outlook for Android

From: Evans, Barry
Sent: Monday, June 20, 2022 12:38:32 PM
To: Darrin Hopper <Darrin@h2flow.com>
Subject: RE: Large diameter tank covers and storage tanks

Can you clarify what this would cover? Supply and installation of 40m diameter tank including cover? Civil works/tank foundation not included.

From: Darrin Hopper <Darrin@h2flow.com>
Sent: Monday, June 20, 2022 12:35 PM
To: Evans, Barry
Subject: Re: Large diameter tank covers and storage tanks

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi Barry,

Based on what I have at hand I would have to say minimum [redacted] and potentially [redacted]

Pretty hard to budget.

But like you said, closer than what you have.

Darrin@h2flow.com

Get Outlook for Android

From: Darrin Hopper
Sent: June 16, 2022 4:03 PM
To: barry.evans
Cc: Jennifer Williams <Jennifer@h2flow.com>
Subject: RE: Large diameter tank covers and storage tanks

Hi Barry,

Can you give me the application, ballpark size, what is it being installed on, etc?

The largest we have done to date is a 101' dome but I have seen much bigger.

Let me know a little more.

Thanks,

Darrin Hopper
General Manager
H2Flow Tanks & Systems Inc.
580 Oster Lane, Vaughan, Ontario, Canada L4K 2C1
Tel: (905) 660-0649 x30 Fax: (905) 660-9744 Cell: (416) 454-7809
darrin@h2flow.com www.h2flowtanks.com

Evans, Barry

From: Dillon Occleston <DOccleston@Greatario.com>
Sent: Tuesday, June 21, 2022 11:49 AM
To: Evans, Barry
Subject: RE: Large tanks

I can't get the 220ft Dome to clear without OBC 2020 specifics, and the one replacement tank would end up being 150x38 to get the 4.7M USG. No price on this yet as it's with Engineering.

Two (2) Sludge Storage Tanks, 1.05 SG, 125 FT x 30 FT, 2.8M USG useable with 2ft Freeboard, Design-Supply-Install = [redacted] + HST (design of concrete foundation ONLY).

**DOES NOT include earth works, civil, piping, concrete.

Dillon Occleston
(519) 575-6586

Section II - Specific Air Contaminant Source Information

Facility ID: 0829065027
Emissions Unit ID: TMP223646
Company Equipment ID: Digestate Storage Tank

One copy of this section should be filled out for each air contaminant source (emissions unit) covered by this PTI/PTIO application identified in Section I, Question 5. See the application instructions for additional information.

1. **Air Contaminant Source Installation or Modification Schedule** - Check all that apply (must be completed regardless of date of installation or modification):

   Initial application for an air contaminant source already installed or under construction. Identify installation date or the date construction began (month/year) 10/2012 and the date operation began (month/year) 10/2013

2. **SCC Codes** - List all Source Classification Code(s) (SCC) that describe the process(es) performed by this air contaminant source (e.g., 1-02-002-04).

   See Facility Profile

3. **Emissions Information** - The following table requests information needed to determine the applicable requirements and the compliance status of this air contaminant source with those requirements. Suggestions for how to estimate emissions may be found in the instructions to the Emissions Activity Category (EAC) forms required with this application. If you need further assistance, contact your District Office/Local Air Agency representative.
   - If total potential emissions of HAPs or any Toxic Air Contaminant (as identified in OAC rule 3745-114-01) are greater than 1 ton/yr, fill in the table for that (those) pollutant(s). For all other pollutants, if "Emissions before controls (max), lb/hr" multiplied by 24 hours/day is greater than 10 lbs/day, fill in the table for that pollutant.
   - Actual emissions are calculated including add-on control equipment. If you have no add-on control equipment, "Emissions before controls" will be the same as "Actual emissions".
   - Actual emissions and Requested Allowable should be based on operating 8760 hr/yr unless you are requesting federally enforceable operating restrictions to limit emissions. If so, calculate emissions based on requested operating restrictions and describe in your calculations.
   - If you use units other than lbs/hr or ton/yr, specify the units used (e.g., gr/dscf, lb/ton charged, lb/MMBtu, tons/12-months).
   - Requested Allowable (ton/yr) is often equivalent to Potential to Emit (PTE) as defined in OAC rule 3745-31-01 and OAC rule 3745-77-01.

Pollutant	Emissions before controls (max)* (lb/hr)	Actual emissions (lb/hr)	Actual emissions (ton/year)	Requested Allowable (lb/hr)	Requested Allowable (ton/year)
Particulate emissions (PE/PM) (formerly particulate matter, PM)	0	0	0	0	0
PM # 10 microns in diameter (PE/PM10)	0	0	0	0	0
PM # 2.5 microns in diameter (PE/PM2.5)	0	0	0	0	0
Sulfur dioxide (SO2)	0	0	0	0	0
Nitrogen oxides (NOx)	0	0	0	0	0
Carbon monoxide (CO)	0	0	0	0	0
Organic compounds (OC)	4.26	0	0	4.26	18.6
Volatile organic compounds (VOC)	4.26	0	0	4.26	18.6
Lead (Pb)	0	0	0	0	0
Total Hazardous Air Pollutants (HAPs)	0	0	0	0	0

Highest single HAP	0	0	0	0	0

Hazardous Air Pollutants (HAPs):

Pollutant	Emissions before controls (max)* (lb/hr)	Actual emissions (lb/hr)	Actual emissions (ton/year)	Requested Allowable (lb/hr)	Requested Allowable (ton/year)
Hydrogen Sulfide(see Modification)	0.013	0	0	0.013	0.06
Ammonia	0.003	0	0	0.003	0.02

Greenhouse Gas Pollutants:

Pollutant	Emissions before controls (max)* (lb/hr)	Actual emissions (lb/hr)	Actual emissions (ton/year)	Requested Allowable (lb/hr)	Requested Allowable (ton/year)	CO2e (ton/year)
Methane	23.1	0	0	23.1	101	2,121

4. **Best Available Technology (BAT)** - For each pollutant for which the Requested Allowable in the above table exceeds 10 tons per year, BAT, as defined in OAC 3745-31-01, is required. Describe what has been selected as BAT and the basis for the selection:

   See Best Available Technology Evaluation document prepared by Azura Associates International Inc. and attached to this application.

5. **Control Equipment** - Does this air contaminant source employ emissions control equipment?

   See Facility Profile

6. **Process Flow Diagram** - Attach a Process Flow Diagram to this application for this air contaminant source. See the application instructions for additional information.

   Process Flow Diagrams:

Attachment ID	Attachment Type	Description	EAC Form Type	Public Document	Trade Secret Document	Trade Secret Justification	Event Date
802720	PFD for digestate storage tank	Process flow diagram		X			

7. **Modeling information: (Note: items in bold in Tables 7-A and/or 7-B, as applicable, are required even if the tables do not otherwise need to be completed. If applicable, all information is required** An air quality modeling analysis is required for PTIs and PTIOs for new installations or modifications, as defined in OAC rule 3745-31-01, where either the increase of toxic air contaminants from any air contaminant source or the increase of any other pollutant for all air contaminant sources combined exceed a threshold listed below. This analysis is to assure that the impact from the requested project will not exceed Ohio's Acceptable Incremental Impacts for criteria pollutants and/or Maximum Allowable Ground Level Concentrations (MAGLC) for toxic air contaminants. (See Ohio EPA, DAPC's Engineering Guide #69 for more information.) Permit requests that would have unacceptable impacts cannot be approved as proposed. See the line-by-line PTI/PTIO instructions for additional information.

   See Facility Profile

8. **Request for Federally Enforceable Limits** - As part of this permit application, do you wish to propose voluntary restrictions to limit emissions in order to avoid specific requirements listed below, (i.e., are you requesting federally enforceable limits to obtain synthetic minor status)?

   No

9. **Continuous Emissions Monitoring** - Does this air contaminant source utilize any continuous emissions monitoring (CEM) equipment for indicating or demonstrating compliance? This does not include continuous parametric monitoring systems.

   See Facility Profile

10. **EAC Forms** - The appropriate Emissions Activity Category (EAC) form(s) must be completed and attached for each air contaminant source. At least one complete EAC form must be submitted for each air contaminant source for the application to be considered complete. Refer to the list attached to the application instructions. Please indicate which EAC form corresponds to this air contaminant source.

Process Flow Diagrams:

Attachment ID	Attachment Type	Description	EAC Form Type	Public Document	Trade Secret Document	Trade Secret Justification	Event Date
802721	EAC for digestate storage tank	EAC	3100 Process operation	X			

FOR OHIO EPA USE
FACILITY ID:_____

EU ID: _____ PTI #:_____

EMISSIONS ACTIVITY CATEGORY FORM
GENERAL PROCESS OPERATION

This form is to be completed for each process operation when there is no specific emissions activity category (EAC) form applicable. If there is more than one end product for this process, copy and complete this form for each additional product (see instructions). Several State/Federal regulations which may apply to process operations are listed in the instructions. Note that there may be other regulations which apply to this emissions unit which are not included in this list.

1. Reason this form is being submitted (Check one)

   ☒ New Permit ☐ Renewal or Modification of Air Permit Number(s) (e.g. P001)_____

2. Maximum Operating Schedule: 24 hours per day ; 365 days per year

   If the schedule is less than 24 hours/day or 365 days/year, what limits the schedule to less than maximum? See instructions for examples. _____

3. End product of this process: Stable anaerobic digestate ready for approved land application

4. Hourly production rates (indicate appropriate units). Please see the instructions for clarification of "Maximum" and "Average" for new versus existing operations:

Hourly	Rate	Units (e.g., widgets)
Average production	10,000	gallons/day
Maximum production	50,000	gallons/day

5. Annual production rates (indicate appropriate units) Please see the instructions for clarification of "Maximum" and "Actual" for new versus existing operations:

Annual	Rate	Units (e.g., widgets)
Actual production	3.65 million	gallons of digestate
Maximum production	18.25 million	gallons of digestate

6. Type of operation (please check one):

☒ Continuous
☐ Batch (please complete items below)

Minimum cycle* time (minutes): _____
Minimum time between cycles (minutes): _____
Maximum number of cycles per daily 24 hour period: _____
(Note: include cycle time and set up/clean up time.)

*"Cycle" refers to the time the equipment is in operation.

7. Materials used in process at maximum hourly production rate (add rows/pages as needed):

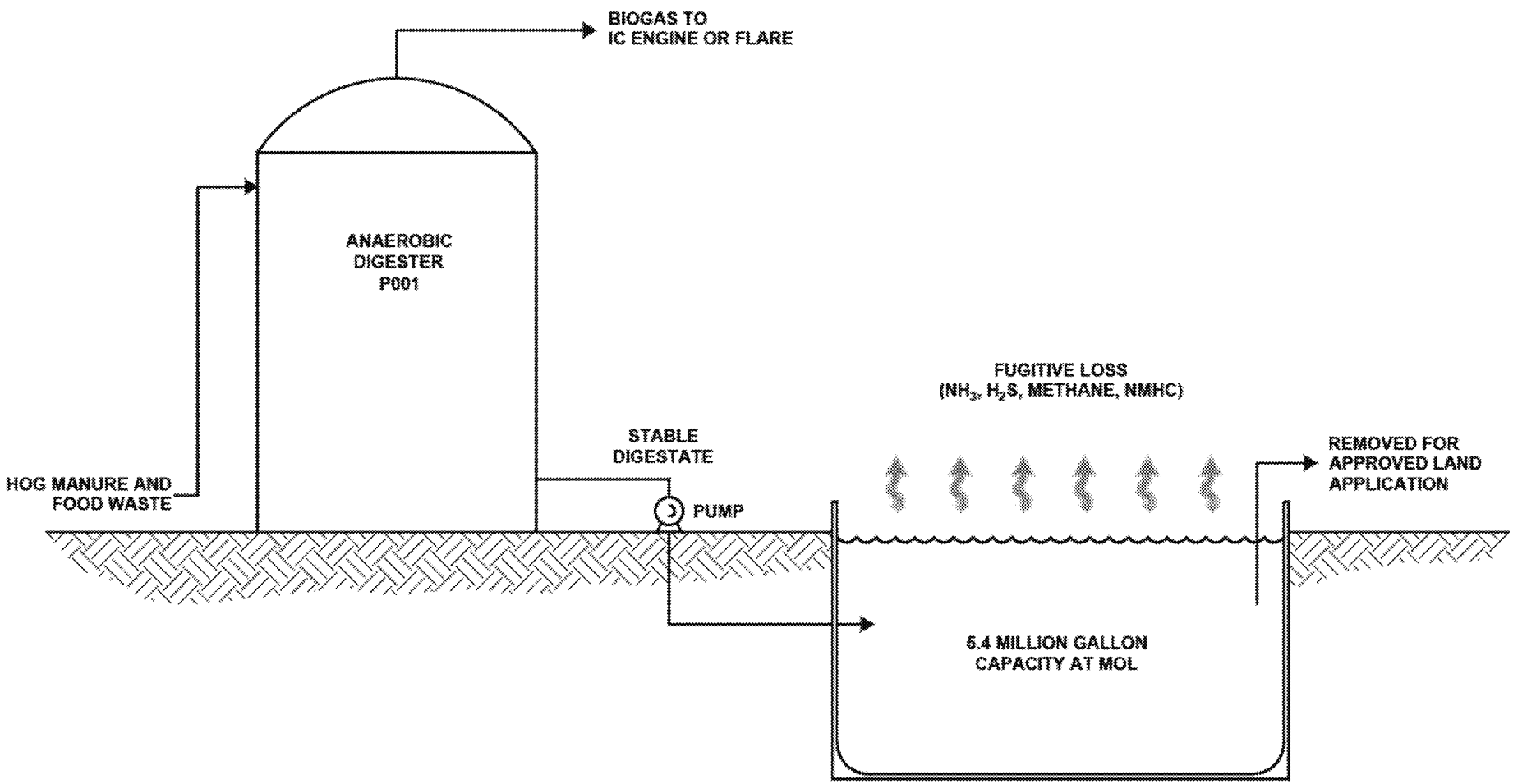
Material	Physical State at Standard Conditions	Principle Use	Amount**
Digestate	liquid	land applcation	10-50,000 gpd

** Please indicate the amount **and** rate (e.g., lbs/hr, gallons/hr, lbs/cycle, etc.).

8. Please provide a narrative description of the process below (e.g., coating of metal parts using high VOC content coatings for the manufacture of widgets; emissions controlled by thermal oxidizer...):

The existing anaerobic digester (P001) is dosed with feedstock (a blend of hog manure and food waste) for digestion. Biogas (primarily methane and CO2) is produced from the anaerobic reaction and is captured and burned as fuel in a power-producing internal cimbustion engine (B001) or flared.

Effluent from the anaerobic digester (stable digestate) is pumped through an underground pipe to the 5.4 million gallon open surface, in-ground storage tank and enters the tank below the surface of the materials. When approved for land applicatipon, digestate is removed from the tank with a high-capacity Nuhn hydraulic pump.



TRC
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PROJECT:
DOVETAIL ENERGY, LLC

TITLE:
DIGESTATE STORAGE TANK

DRAWN BY:	D.STEHLE
CHECKED BY:	J.SLAYBACK
APPROVED BY:	-
DATE:	JUNE 2022
PROJ. NO.:	487700.0000
FILE:	487700.0000.01 PFD.dwg

FIGURE 1